

Chemical Weekly

AUG 1990
O.P.T.H.I., MYSORE

VOL. XXXVI

NOVEMBER 27, 1990

No. 12

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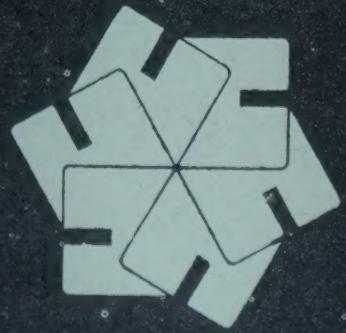
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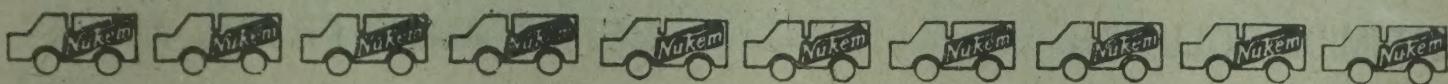


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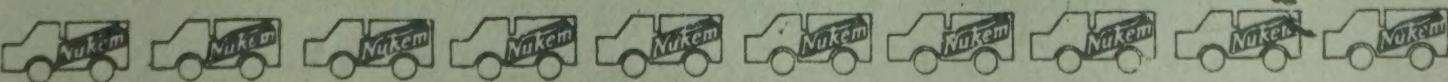
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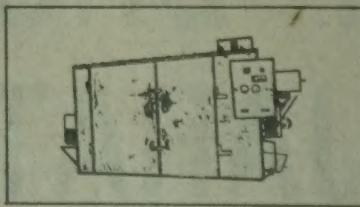
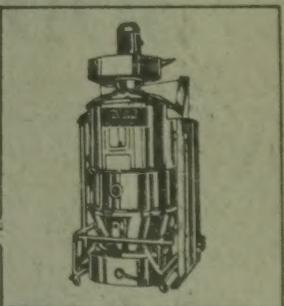
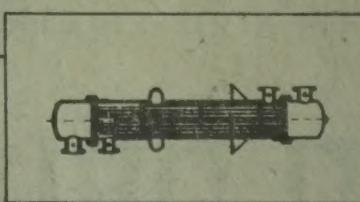


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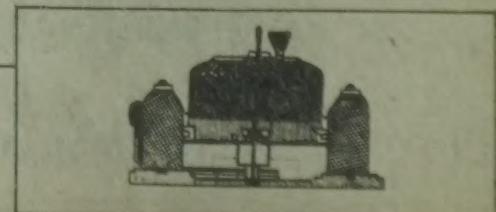
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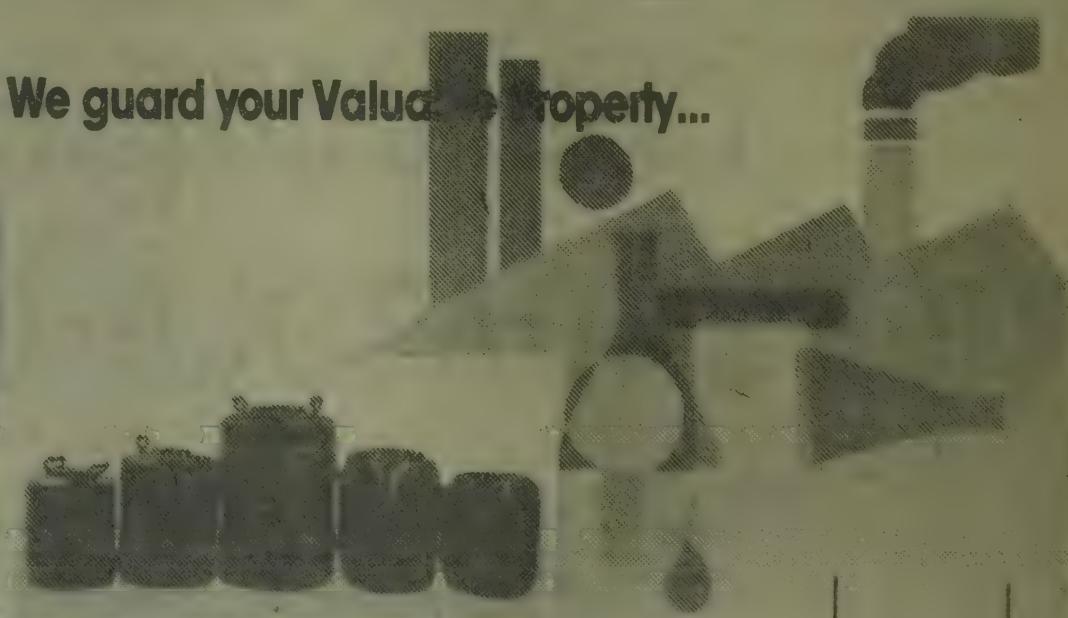
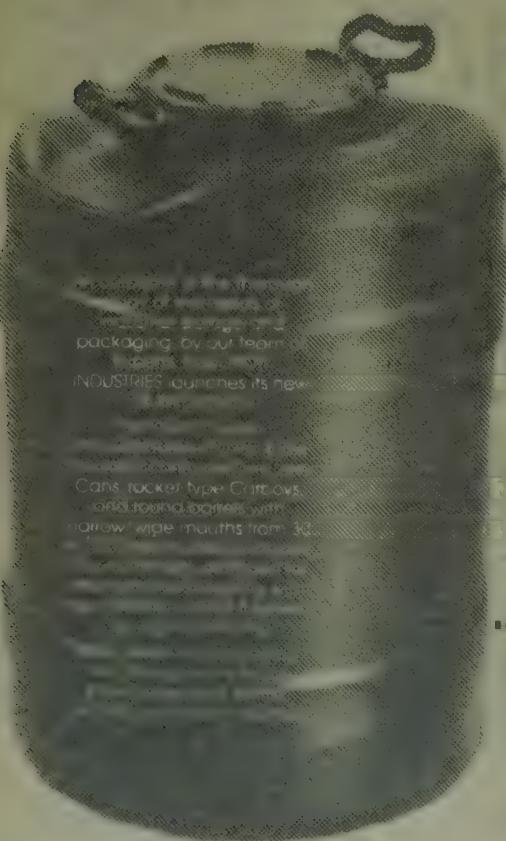
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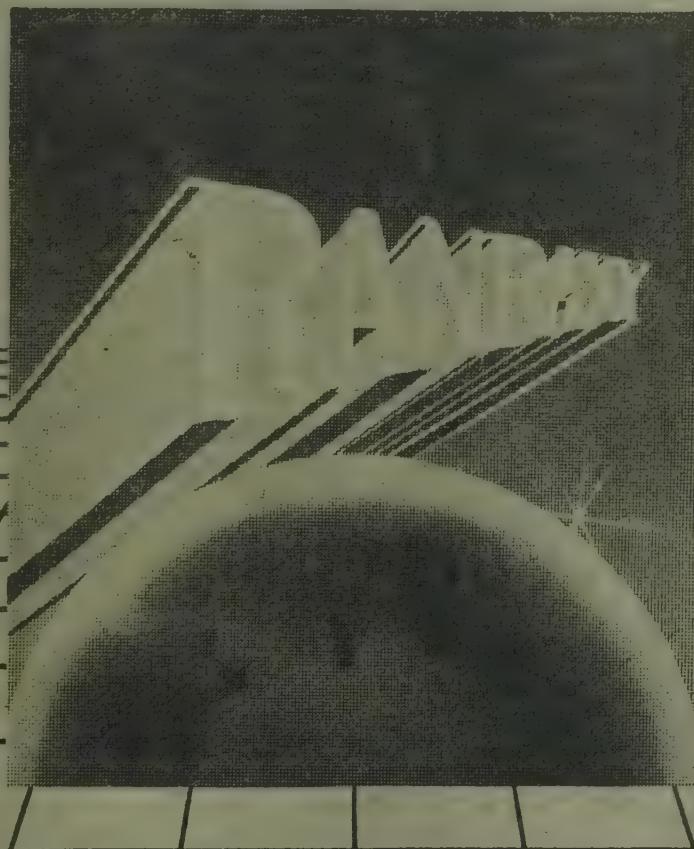
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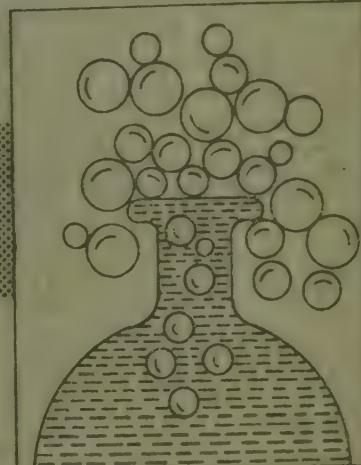
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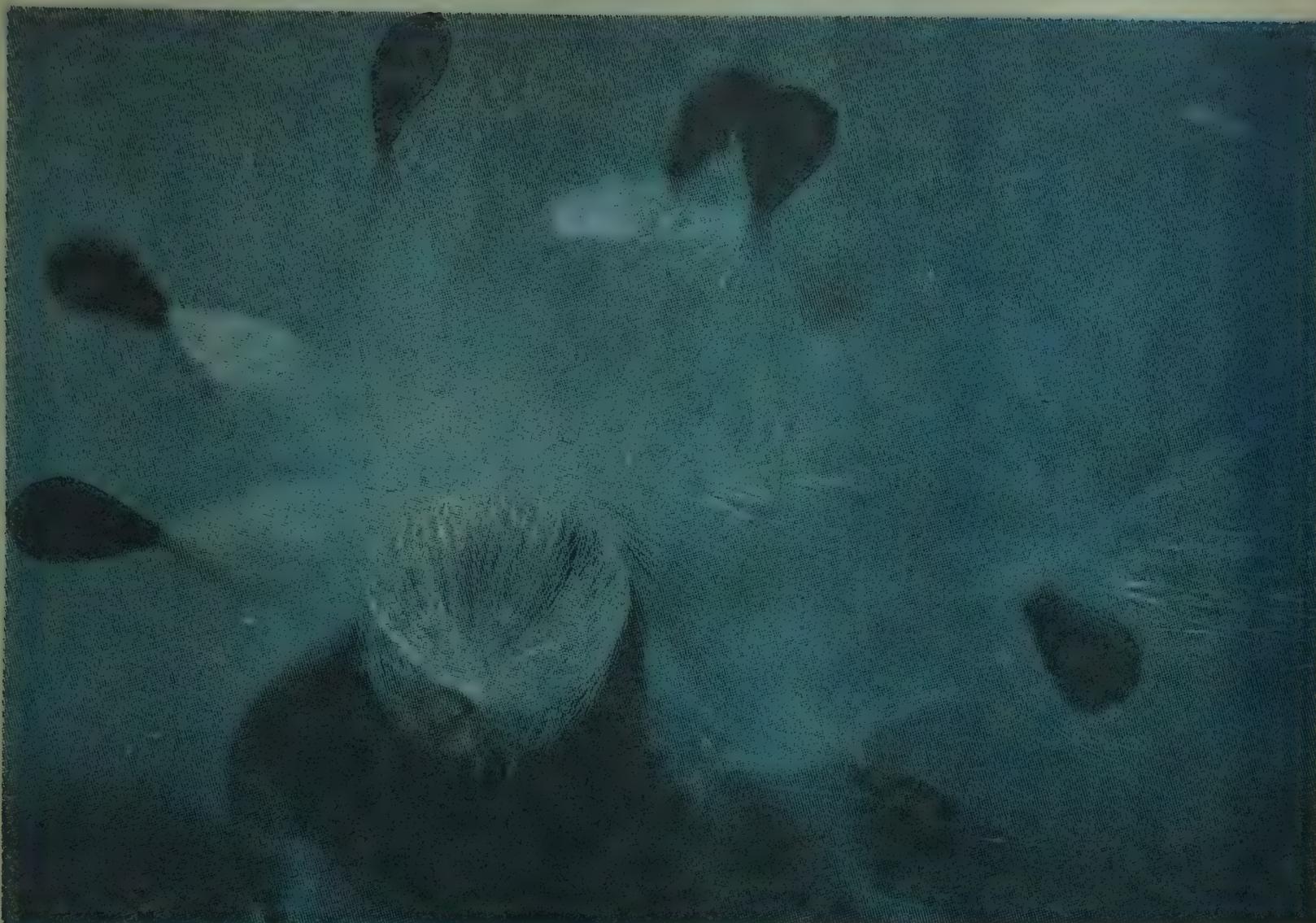
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Chemical Weekly

VOL. XXXVI

NOVEMBER 27, 1990

NO. 12



Publishers:
SEVAK PUBLICATIONS

Editor - Publisher
R. RAGHAVAN

Advertisement Manager
N.R. RAJAGOPALAN

Administration/Circulation
VIJAY RAGHAVAN

Editorial & Administrative Office:
306, Shri Hanuman Industrial Estate
G.D. Ambekar Road, Wadala,
BOMBAY 400 031.
Phones: 4120743/4131198.
Telex: 011-76053 CWLY IN

Madras Office:
Room No. 9, Wellington Estate,
3rd Floor, 24, Commander-in-Chief
Road, Madras 600 105.
Phone: C/o. 471659.
Telex: 041-6290 CWLY IN.

Printed at:
Sevak Publications,
25, North Mada St., Thiruvanmiyur,
Madras 600 041.

Fast Print Service,
307/308, Shri Hanuman Indl. Estate,
G.D. Ambekar Road, Wadala,
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Annual Subscription Rates:
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Inland: Rs. 400.00
Foreign: US\$ 175.00 (Air Mail)
US\$ 75.00 (Sea Mail)

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CHEMICAL WEEKLY

VOL. XXXVI NOVEMBER 27, 1990

NO. 12

A New Era for Wind Power in the United Kingdom

The inauguration of England's largest wind turbine at Richborough, Kent, in July heralds a new era for wind power in the UK. Despite this particular renewable energy source's obvious advantage over nuclear, coal and even gas power generation, it has been criticised in the past for being prohibitively expensive, and for creating potential eyesores on the landscape.

One cheap method of generation that does not produce any pollution is wind energy. It produces no radioactivity, no acid rain and no greenhouse gases of any sort. It is also reasonably cheap — the most authoritative estimates are that an installed capital cost of around 600/kW can be achieved when wind turbine generators are in series production. Wind energy costs less than coal or oil or nuclear energy.

Development of wind technology

The reason that wind energy is so cheap is that it has been widely and actively developed in recent years. In America, Denmark and several other countries around the world, Government support has encouraged private investment in wind power and more than 16,000 wind turbines of various sizes have been built for power generation. Many of these are in California where more than 1 GW of generating capacity was installed during a year three-year period in the 1980s when the tax credits were at their height.

Under the stimulus of these subsidies, engineering techniques and standards developed rapidly and costs fell so that wind energy is now attractive economically. Some of the most successful installations have been British. For example British Aerospace and Taylor Woodrow, a leading civil engineering company, formed a joint venture under the name of the Wind Energy Group and they have many successful machines and wind farms operating around the world.

The load factor of most combustion plant is determined by its place in a merit table and the way in which power system requirements vary. Most fossil fuelled plants spend most of its life two-shifting or on single shifts at best. A life-

time load factor of 30 per cent is quite normal, particularly now that plant lifetimes are being extended to 40 years or more. Load factors for wind power plant on good sites are around 30 per cent but that is determined by wind availability rather than by the power demand.

Reliable wind power plant

Plant availabilities can be very high for wind turbines compared with most other power plant because of their relatively small unit sizes. A modern multi-megawatt wind farm usually consists of a number of medium sized wind turbines, each individually rated at around a quarter or one third of a megawatt. Erection of an individual machine is typically completed in a couple of days on site, and any major repairs, such as a blade or gear-box replacement, can normally be carried out on a similar time scale.

Plant availabilities in excess of 95 per cent are the norm for successful wind farms and this is in sharp contrast with other types of power plant. The best modern combustion plant finds it difficult to average 92 per cent. The maintenance schedules required for nuclear plant make it difficult to achieve better than 80 per cent and most nuclear stations fall well below that level; 50 per cent or less is all too common.

Load factors for wind power plants on good sites are around 30% but is determined by wind availability rather than by the power demand.

Firm power from the wind

Most power systems around the world accept that the majority of their load is uncontrollable and statistically fluctuating, predictable only within limits. This description fits wind power quite well and most power system operators would be very happy if a significant proportion of their individual load connections had 30 per cent capacity factors, as wind plant has. Indeed, wind power plant can be incorporated directly into any power system model by treating it as negative load.

One criticism directed at wind power is that it is not dispatchable because the wind does not necessarily blow when it is wanted. This point is usually made by Americans. It might be more readily understood if it came from the Germans who are quite wide-spread in their use of disconnectable-load tariffs. A capacity of more than 10 GW of wind power is evidently a long way off in the United Kingdom.

Wind energy resources in UK

The total wind resource in the whole country is very large. Each square kilometre could accommodate some 4 MW of wind turbines, for example if sixteen 250 kW machines, each 25 m diameter were spaced 10 diameters apart. On that basis, if the entire country, which is some 250,000 square kilometres, was covered with wind farms, it would add around 1,000 GW and that would be about twenty times the installed capacity of present power system! Winds as strong as those on the successful Californian wind farms are available in the UK over substantial areas of countryside, perhaps 1,000 square kilometres, 0.4 per cent or so of the total land area. That would be sufficient to generate as much as 4 GW of wind power if the whole area could be used for wind farms.

Only 1 per cent of the land over which a wind farm extends is actually occupied by wind turbines or their connecting access roads and the rest of the land can continue to be used for crops, grazing or other activities. Nevertheless, even such limited coverage would obviously be wholly unacceptable over large parts of the country. Urban areas must obviously be rejected and environmental and other constraints will limit the rural areas that can actually be used. National Parks, areas of great natural beauty, sites of special scientific interest and many others should obviously be avoided as far as possible but most of the countryside is given over to ordinary farmland and there is plenty of that.

It is usually envisaged that only a small fraction of the total amount of farm land around the countryside would be wind farmed in this way, perhaps a few per cent of the total area. This would still be sufficient for, say 20 GW of wind power plant. So, a fair amount of wind power is available from the windiest sites and a good deal more altogether. European technocrats envisage that in twenty years time 5 per cent of all electricity in the European Community will be generated as wind power and the EC have major research, development and demonstration programmes to support that aim.

Wind farms planned for Britain

The first major wind farm in Britain is likely to be at Capel Cynon in West Wales, 24 km from Cardigan along the A486 to Aberystwyth. It will be operated by PowerGen. The site covers some 750 acres and the space needed for the per-

manent installation, including wind turbines, a substation, a control centre and access roads, will be less than 1 per cent of the land area. The rest of the site will be able to be farmed normally. It is planned to build 25 wind turbines, on cylindrical towers 25 to 30 m high with 33 m diameter rotors, two- or three-bladed, each generating around one third of a megawatt of electrical power to be fed into the local network.

Planning permission has already been given for the first privately-owned wind farm at a site in North Cornwall (*Energy World*, No. 179, p.5). National Power recently announced that they hope to operate a second wind farm in Cornwall. They have applied to North Cornwall District Council for permission to build 23 wind turbines on a 675 acre site at Cold Northcott on the edge of Bodmin Moor near Launceston, to generate about 7 MW of power from the wind, to be fed into the local electrical network. At the same time, Yorkshire Electricity and Yorkshire Water hope to get consent for an 80 acre wind farm at Ovenden Moor by the end of 1990. Other developers are also in the field.

Other UK developments

The planned wind farms will all use medium sized wind turbines on tubular steel towers with two or three bladed rotors about 30 m in diameter. Such designs, generating 0.3 MW or 0.4 MW seem to be the most economical ones this stage. James Howden of Glasgow have manufactured more than 100 of their HWP300/28 series. WEG, the joint venture between Taylor Woodrow and British Aerospace, have already built more than 20 of their three-bladed MS2 machines and they have eight of their two-bladed MS3s operated or being manufactured. The MS3 is the most advanced proven British design available; it has a teetered hub, and it will be a strong contender for the various wind farm contracts. Nevertheless, Danish, Dutch and Belgian manufacturers will no doubt be reminding the privatised power companies of their European obligations and pressing for serious consideration of their tenders.

Multi-megawatt developments, such as the 3 MW British LS1 built by WEG for the North of Scotland Hydro Electricity Board on Orkney and equivalent American, Swedish and German designs, have proved less immediately successful than the more recently developed medium-sized machines. But the tendency now is to move back towards higher ratings. A 500 kW version of WEG's two-bladed MS3 is planned while other manufacturers have recently built larger developments of their earlier machines. James Howden of Glasgow recently constructed a 1 MW wind turbine for PowerGen behind Richborough Power Station in Kent, which started operating at the end of 1989. The three-bladed rotor is 45 m in diameter and has variable-pitch tips for aerodynamic control.

Sir Robert MacAlpine recently installed their VAWT 850, a 500 kW version of their straight bladed vertical axis design at Carmarthen Bay where National Power, PowerGen and the Department of Energy have a joint Wind Energy Demonstration Centre. Colin Moynihan, the Minister for Energy, started up this machine in August 1990. The planning problems for large numbers of wind turbines will be akin to obtaining consents for transmission towers, which are quite comparable as far as the size and number of units required are concerned. Such problems are far less contentious than those of nuclear reactors or coal-fired stations.

With a transmission line, the difficulty is not to find acceptable sites for the majority of towers but to find a continuous line for all of them between two fixed points. There is no such problem for wind turbines. If some of the potential sites prove unacceptable, they can be omitted without destroying plans for the whole project, which is always the most serious difficulty with a transmission line. Wind turbines are widely regarded as more visually appealing than lattice transmission towers or pylons. Indeed, James Howden of Glasgow built more than 100 replicas of their elegant three-bladed design which won a Scottish design award. Environmental and planning objections to wind parks seem certain to be considerably less than those to other sorts of power station or to transmission lines.

Environmental constraints

The environmental effects of wind turbines over large areas of private farmland will be localised to the farms themselves, and will therefore concern local farmers and landowners much more than members of the general public. Private land-owners are likely to welcome the construction of wind parks on their land since there will be substantial increases in land values and revenues. The density of wind turbines on a farm will be around 4 MW per square kilometre. This represents an investment of up to £ 15,000 per acre, which is probably more than ten times the entire value of the farmland which is usually worth less than £ 1,000 per acre in remote, windy areas. A land-owner would only need to lease 1 per cent of the land area for building wind turbines and access paths but otherwise most farming uses would be largely unaffected.

The situation would be similar to that for transmission towers, many thousands of which are spread across farmlands and other countryside areas with little or no effect upon the farming that is carried on around them. What proportion of the £ 15,000 investment per acre to be put into wind power plant should or could be paid to lease a small part of the land for construction would be a matter for individual negotiation. Wayleaves for transmission towers cost very little but only a few per cent on the generation cost of wind power would suffice to purchase the entire land area outright, not just to

lease the small fraction of it actually required to erect the wind turbines. Evidently agricultural farmers could find it very lucrative to become wind-farmers.

The environmental effects of wind turbines are very localised compared with almost any other type of power plant. Radioactivity, acid rain, carbon dioxide and greenhouse gases associated with other methods of generation have polluting effects that spread worldwide. The environmental problems that do exist with wind power, such as visual amenity, noise or TV interference, have far less serious consequences.

The general public will not be greatly affected but to the extent that they are, their objections are not likely to be very strong because the wind power plant is inherently non-polluting and not particularly offensive. Those most directly affected, the local farmers and private land owners, will be amply compensated in cash for any inconvenience which they may be caused. They can be expected to encourage wind power developments on their own private farmland.

Winds of change in Europe

Many observers believe that the next large stage for substantial growth in wind generating capacity may be in Europe, where development efforts have lagged those in the United States by several years. This has been the case despite a proliferation of European-based wind turbine manufacturers in the 1980s largely to supply machines to the rapidly expanding independent power market in California. There are active wind development and demonstration programmes in nearly every country in Western Europe as well as under the auspices of the Commission of the European Communities, the umbrella organisation that is bringing about the integration of a true European common market set for 1992. Some 200 MW of wind turbine capacity have already been installed in Denmark; several tons of megawatts are operating in Germany; and other countries, including Britain and the Netherlands, also count installed capacity in the megawatts.

Several European countries, including Denmark, Germany, and the Netherlands, have had significant government subsidy programmes for wind energy systems. Both land-based and offshore installations are being planned under these programmes.

Many of the European government programmes are stressing large, multi-megawatt wind turbines. And in addition to multiturbine wind power plants interconnected to utility systems, as found in the United States, another application of wind turbines is being explored in some European countries — namely, their use with diesel generators in a hybrid arrangement for geographically remote, electrically isolated power systems.

Sea-based wind-power plant

A sea-based wind-power plant was recently "launched" in Blekinge province in southeast Sweden. Yielding 500,000 kW annually via two cables to the power grid, the installation will be studied for five years. Including its effects on marine ecology and radar traffic. If the operation is successful, it will be followed by another 97 plants in a 10 km-long row along the Baltic coastline, built in 14 groups — or "wind-power farms". A 10 MW capacity, claimed to be largest in Asia has been installed in record time at Lamba in Gujarat by the Department of Non-Conventional Energy Sources.

In the 1980s, a handful of utilities were showing interest in wind energy as a potentially viable future resource option for their own investment. Their interest was motivated less by the cost of electricity from then-current turbines than by the wind's strategic potential value as fuel displacer (and a hedge against future fuel price rises) that entails zero pollutant emissions. Thus upturn in utility interest was reflected in the participation of nine utilities with EPRI and the Department of Energy in the formation of a wind energy interest group.

Feasibility study

Against the backdrop of a brightening utility outlook on wind energy's long-term prospects — and encouraged by the realisation that relatively modest enhancements could move wind turbines squarely into the realm of economically attractive electricity generation costs — EPRI organised and cosponsored with U.S. Windpower an advanced-turbine feasibility study in 1987. Three utilities (PG & E, Virginia Power, and the Bonneville Power Administration) participated in technical reviews of the work. Within a short time, EPRI was helping to organise a consortium for a five-year programme headed by U.S. Windpower that would develop and commercially manufacture such turbines for both domestic and international markets. PG & E is participating in the effort, and other utility co-sponsors are anticipated.

The development target is a variable speed machine that employs advanced electronic control, in part scaled up from adjustable speed motor drive technology. Somewhat larger wind-speed operating envelope is expected to improve energy capture by 10 per cent or more and to result in reduced dynamic stresses. And because the turbine's drive shaft can speed up with higher winds, storing some of the additional energy as kinetic energy, the design also permits a higher power rating for a given rotor length.

At 54 feet long each, the advanced turbine's three blades will sweep an area over three times the area swept by the 100-kW model's 28-foot-long blades. The rotor will be var-

iable pitch, made of fibre composite and faces upwind. The advanced machine will have three times the power rating — 300 kW. It features a parallel-shaft transmission with dual generator output shafts. The tower, like those used for the 100-kW model, is an open truss type.

As mentioned, variable speed is not an entirely new wrinkle for wind turbines. But most earlier, experimental variable speed machines employed fairly crude electronics that could add substantial harmonic currents to the line output. The advanced U.S. Windpower turbine's power electronic controller initially is being developed around a power Darlington transistor, essentially a high-power, high-frequency on-off switch. The transistor-based converters will rectify the generator's variable-frequency AC to DC and then invert it back into relatively harmonic free, constant-frequency (60 Hz) AC for relay to a step-up transformer and supply to the utility grid.

Source of quality power

In addition to softening the drive train through variable-speed operation of the generator, the electronic controller will permit the turbine to be set to consume reactive power from the utility system or to supply it to the system, depending on the need, or to operate at unity power factor (in which reactive power is neither added to nor taken from the grid). It is this variable speed, power electronic feature that will give the advanced turbine what experts call utility-grade power quality and will transform the turbine from a potential system interconnection worry for utilities to a more valuable addition to the system. As the cost of advanced electronics continues to drop and reliability improves, the Darlington transistor at the heart of the controller now under development could give way to higher power, higher-speed insulated gate bipolar transistors. Eventually, the goal is to use metal oxide-controlled thyristors. Such so-called smart power modules potentially could also feature self-checking diagnostic controls and error correction.

Observers of the EPRI-utility-U.S. Windpower advanced-turbine development effort seem unanimous in applauding the commitment to technology development and the utility interest in wind power that the project implies. "We're bullish on variable-speed technology for wind turbines," says Robert Thresher, Manager of the wind research branch at the federal Solar Energy Research Institute. "But the nemesis of applying variable speed at larger machine sizes is how much it adds to the cost. That's where the U.S. Windpower programme is pushing the frontier onward. They're trying to bring the advantages of variable speed to turbine size and architecture that really has the potential to be cost effective."

— T.P.S. RAJAN

(Excerpts from Taylor Moore's article in *EPRI Journal*, June 1990).

CHEMARENA

S.L. VENKITESWARAN

Ethylene from natural gas

The focus is increasingly on the use of methane as feedstock for petrochemicals. The C-one chemistry has been much talked about but the only success so far has been with acetic acid by carbonylation. Methanol to ethylene (direct or via ethanol) and to monoethylene glycol via formaldehyde are on the fringe while other attempts to use synthesis gas itself are somewhat behind. Methanol has been used for motor gasoline and can also serve for diesel fuels but this is moving away from the objective i.e. petrochemicals.

The coupling of methane molecules to ethylene via an oxidation or dehydrogenation is an obvious promising approach and has been referred to in these columns. A recent study (which is continuing) is in the Laboratories for Chemical Process Technology in Netherland. Catalysts for such reaction based on metal ions show promise and a lithium-magnesium oxide catalyst is reported to be promising with 30% conversion and 80% selectivity to C_2 or upto 50% conversion with 50% selectivity. Certainly higher yields of ethylene are desirable but a balance has to be struck between yields and recycles. Tubular fixed-beds or multistage packed beds or fluidised beds using methane and pure oxygen are workable and oxygen has to be fully used up. The catalyst is to be recycled continuously and optimum conditions evolved. A 350,000 TPD ethylene plant has been projected on a 20% conversion per pass with 80% selectivity basis but perhaps it is too early to venture on a commercial basis for this new process from Netherland which was reportedly supported by Shell.

Conversion of methane can be by various alternatives if the product required is gasoline which of course is vital for a country which has less of crude oil but excess of natural gas. Methane can be oxidatively coupled with reducible metal oxide catalysts at about 500°C and 55 psig with a separate cycle for catalyst reoxidation. The product is a mixture of methanol and formaldehyde in ratio of 4:1 and can be converted to gasoline by ZSM catalyst. Oxychlorination is another way and methane is reacted with HCl and oxygen in fluidbed reactor at 230 psig and about 250°C using a catalyst of cuprous chloride, potassium and lanthanum chlorides. The chloromethanes are to be heated and oligomerised to produce gasoline range hydrocarbons and HCl for recycle. Partial oxidation of methane to the synthesis gas is well established and the best way to get synthesis gas for Fischer Tropsch or methanol and subsequent MTG to gasolines. The attempts are for a cheaper route to the liquid fuels with alternatives to the energy intensive synthesis gas and see if cost can be reduced from the levels for methanol and MTG process.

But all the approaches to liquid fuels from methane result in high cost products workable only when crude oil prices shoot up.

There was a report on conversion of methane to liquids of kerosene range by one of our National Laboratories but apparently it is too early at present for any commercial exploitation.

Ethane to ethylene

Ethane is cracked with steam at high temperatures to get ethylene with some byproducts as per present practices. However direct dehydrogenation of ethane has always attracted interest but not good enough to displace steam cracking. There is however a new process for oxy-dehydrogenation reported by Phillips Petroleum. This uses a special catalyst of lithium and tin chloride with magnesium oxide. It claims higher yields and lower energy needs. Present estimates for a 450,000 TPA ethylene plant is that the capital outlay will be 13% lower and production costs lower by 0.65 cents per lb on manufacturing side with 1.7 c/lb overall. The investments are likely

to be \$283 million and overall costs about 19 c/lb of ethylene. But there is uncertainty about the life or time-span of catalyst and these questions are likely to be thrashed out soon. Propane to propylene by dehydrogenation is already a proven technology and perhaps ethane to ethylene may follow in a few years, eliminating steam cracking of C_2-C_3 for olefines. India should have a good look at this before the Auriya Complex is finalised.

There is also a process for propane directly to acrylonitrile which is said to be ready.

Fires in Chemical Plants

There was a big fire accident at Du Pont's methanol plant in USA which has a capacity of about 800,000 tonne per year. It was to be out of production for several weeks and the fire is said to have been due to a leakage of hydrogen. Supplies of methanol in USA, already tight, have been further disrupted and prices have gone up.

Another explosion in a benzoyl peroxide plant was reported in Japan. This led to 8 deaths and 18 burn victims and reportedly due to mishandling of benzoyl peroxide 98% at the time of repacking.

A blast in an aromatic plant of Kemtec in Montreal,

Canada, has shut off production of para-xylene. More details are not available. The acetic acid plant of Hoechst Celanese based on butane oxidation in Texas has restarted after an extended shutdown and total revamping after a disastrous explosion. The polyethylene plant of Phillips Petroleum is expected to be restarted in stages after a severe explosion shut it down (along with other plants) a few months back. While all care is being bestowed on designs and equipment for hazardous processes or operations, mishaps seem to lurk even in the advanced countries.

But these do not condone the serious mishaps of IPCL gas cracker recently in a storage area at the time of start-up.

Methanol at lower energy consumption

The synthesis of methanol is an equilibrium reaction and generally a large part of gases have to be recirculated. The conversion of methane or hydrocarbons is also energy intensive. The limits have apparently been reached in energy integrated systems and more recent efforts are to beat the equilibrium to get much higher and nearly completed at one go in the formation of methanol. This is possible if the methanol formed is removed from the reaction zone so that the conversion levels go up.

A recent study is on use of a solvent to remove the methanol -- SMP process. The solvent can also serve for heat removal and be continuously removed partly, methanol fleshed off and returned to the reactor after cooling. For a successful system the solvent selected has to have a high boiling point, stability at high temperature and good solubility/partition coefficient for methanol. There should not be diffusion limitations which could slow down reaction rates per unit volume. The solvent chosen after vapour liquid equilib-

rium data was triethylene glycol methyl ether, TEGME, with temperature of 275°C. The reaction rates were lower but only is to the extent of requiring larger (2 to 2.5 times) reactor volume as compared to conventional system. But this is compensated by savings in elimination of recycling and compressors for the same as also in heat exchange capacity with no build up of inerts.

A notional design for 500 TPD plant may need 5 m. x 6 m. dia reactors, three in series with inter coolers. Solvent load is high at 15 kgm. per kgm methanol capacity and of fairly high initial cost even if losses are low.

The costs are claimed to be lower by about 10%. The overall energy need will be lower. There are also other proposals such as a liquid phase reaction using hydrocarbon oil to fluidise the catalyst and another using a fine absorbent powder to pick up the methanol. The methanol/syngas process is likely to see major changes in the coming years.

Naphtha etherification

Methyl t-butyl ether is a hot item of high growth rate for use as a substitute of TEL to get higher octane rating. Ethyl t-butyl ether also is equally effective. Now we have a process for etherification of a naphtha fraction, particularly of C₄ fraction of cat cracking. Cat cracking results in gases with olefines and C₃ and C₄ are generally recovered and used for chemicals or dimerised for use in gasoline blends. Now British Petroleum's "Etherol" process claims to have a better alternative for C₄ and higher olefins through isomerisation and etherification with methanol. A special catalyst is used in a series of two upflow reactors and two plants

are said to be in operation. The process leads to reactive olefins and ether yields as under:

	Reactive Olefins	Reacted ether %
C ₄	16%	95%
C ₅	29%	65%
C ₆	20	40

An overall methanol content (as ether) in the product is said to be 6.3% -- a good addition to the volume of blend for gasoline besides raising octane value.

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O.P. KHARBANDA

FRANKLY SPEAKING

Dr. O.P. KHARBANDA, Cost & Management Consultant,
 501, Olympus, Altamount Road, Bombay 400 026.
 Phone: 91-22-362728 Telex: 11-5214 Fax: 91-22-2864091
 E.A. Stallworthy, Management Consultant, Coventry, U.K.

Waste Management — Towards a Sustainable Society

The problem of waste disposal is rapidly assuming enormous proportions to which there seems to be no limit. Till now, the various solutions adopted have been of a 'piece-meal' character: what we might term 'firefighting', without any real regard to the long-term implications of the particular solution being adopted. This short-term approach has played havoc in the field of waste disposal. In establishing a solution to one problem, other and even more serious problems have often been created, thanks to 'the hidden dangers'. Waste, if not properly treated and handled, not only threatens human life in the short term, but the environment as a whole in the long term. Warnings of this nature were first raised some twenty-five years ago now by the missionary Rachel Carson, now seen in retrospect to be living well ahead of her time. The warning was sounded in her book *Silent Spring*. The fears she then expressed, which were based on very limited data, have been confirmed more recently by a sequel, *Silent Spring Revisited*, by (American Chemical Society, 1988). Waste dumps, the most common disposal technique in the United States and most other countries, have proved to be no solution. The problem is only hidden away, and surfaces after a period of years, sometimes with disastrous results. The problem is fundamentally one of **waste management**: waste has to be 'managed'. This is an immediate problem that can and should be tackled **now** by management, and it should be tackled in basic fashion. Existing industrial processes should be assessed and ways sought to minimise or eliminate such waste as they create. New processes should not be introduced until they have been exhaustively studied from this point of view. What is more, not only the immediate situation should be assessed, but its consequences in relation to others. For instance, plastic bottles may

have economic advantages for the drinks manufacturer when compared with glass bottles, but they are an environmental disaster. We should look for processes and products where there is no waste. Failing that, the quantity of waste, harmless or not, should be reduced to minimum: what we haven't got cannot hurt us! Where waste is inevitable, can it be recycled for profitable use? Chemical or biological degradation must be the last resort. Incineration sounds a very acceptable solution, but unfortunately we not only have the problem of fumes, but the residual ash is often very dangerous, since it is often toxic. Responsible methods of management are required that will ensure the isolation of hazardous waste from the environment for a very substantial time period: some say till the next Ice Age! Proper integrated waste management must consider the entire ecosystem. Only thus, what is called 'clean technology' will be achieved. The public interest should always come first, rather than private profit. Waste management affects us all: it should therefore be the concern of those in positions of responsibility throughout industry and not only to the experts. Waste will always be there to be disposed of, but let us at least seek to ensure that it is disposed of safely. Man is far from perfect, but the systems which he designs and operates with should be so organised that there is the minimum of damage not only to his fellow human beings, but to the environment in which he has to live. The priorities, therefore, need to be rearranged such that waste treatment and disposal must be the last option, thus:

- Non-waste technology
- Waste minimisation
- Recycle and recovery of waste materials
- Waste treatment/disposal

The logic for this is quite simple. If you can eliminate waste generation, the problem is tackled at its 'roots', for what you do not have cannot leak or hurt. Taking for granted that waste generation is inevitable is really looking at a short-term solution to this serious problem. (Adapted from author's title: 'Waste Management — Towards a Sustainable Society' (Gower 1990).

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of repute. His recent title: *WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY* (Gower 1990); *PROJECT TEAMS — THE HUMAN ELEMENT* (Blackwell/NCC & Company, 1990); and *COMPANY CULTURE — IT'S ROLE IN AN INDUSTRIALISED SOCIETY* (McBuny Press, 1990). Available from Vivek Enterprises, 5 S.K. Barodawalla Marg, Bombay 400 026.

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TPL not to take over MPCL

The Tamil Nadu Petroproducts Limited (TPL) has decided not to takeover the sick Madras Petrochemical Limited (MPCL), which is now under the management of the financial institutions led by the IDBI, it is reliably learnt. TPL's decision not to pursue is justified on the ground that "it will be a drain on the energy of TPL both financially and technically to revive this unit".

A committee of TPL experts went into the question of taking over this sick unit whose recommendation was reportedly placed before the recent board meeting. The committee in its concluding remark stated '.... with the above background, the managing director discussed with the chairman and decided to write to the industries secretary that TPL will not be interested to further pursue the proposal'.

The MPCL was previously known as Nagpal Petrochemical Limited and managed by Nagpal Ambadis until 1978 when it became sick. The FIs took active interest that year by converting their loans into equity following the unit becoming sick. IDBI and banks together hold 31 per cent of the total equity of Rs. 290 lakh, with the balance scattered among the original promoters and public. Preference shares are also there.

The company has started to produce transformer oil, white oil HLP and LLP,

petroleum sulphonate H RSL, sulphuric acid, petroleum jelly etc. with technical collaboration with Witco of USA. The products manufactured by MPCL, according to informed sources, are well received in the market. When contacted, Mr. H. Krishnamurthy, chairman of MRL, told *The Economic Times* how he was interested in taking over MPCL provided the BIFR/IDBI accepted its earlier proposal of taking over the assets.

Various reasons are attributed to the MPCL turning red as far back as 1978. Its capacity utilisation had not been encouraging, working capital requirements were not forthcoming from the bankers and there was also the case of alleged mismanagement earlier. For instance in 1986-87 the actual production of transformer oil was only 7736 tonnes against the installed capacity of 18,750 tonnes and that of speciality oil was 2,100 tonnes against the installed capacity of 10,000 tonnes, as per the balance sheet.

The case of MPCL was referred to the BIFR in 1989 only. Following non-availability of working capital and other financial constraints, machinery and equipment could not be replaced for a long time and the maintenance, according to sources 'was below average'. There are 250 employees.

The TPL expert committee in its report has estimated that the cost of rehabilitation would need at least Rs. 17 crores (modernisation Rs. 8 crores, essential Rs. 6 crores, vital jobs Rs. 2 crores and desirable expenses around one crore). The period of implementation of this programme was put between six months and 24 months.

The biggest problem to be tackled by the new management — be it TPL or MRL or anybody else — is that of the disposal of sludge accumulated over the last 20 years, with no precise estimates for deposits. Estimates vary between 40,000 mt and 60,000 mt of sludge. It is stated that the pollution control board had already given notice to MPCL.

While acquiring the assets will enable TPL to obtain all the benefits of running the plant without accountability to shareholders with improved profits, TPL cannot expect tax benefits on the MPCL's past losses.

Similarly though merger of MPCL with TPL will mean tax benefits to TPL from the set-off of brought forward losses of the former, against TPL's future taxable profits, and that increased profits for MPCL due to TPL's investment accruing to TPL in its entirety, at the same time tax benefits to TPL will be available only from 1993-94 as TPL has taxable profits only from that period.

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Italian company offers chemical project tieups

The Ferruzzi Montedison group, an Italian conglomerate, is strengthening its presence in India through technology transfer to chemical industry and investments in private sector projects.

Technimont, an engineering company of the group, has signed an agreement with Gas Authority of India Limited (GAIL) for setting up a polypropylene unit at Bijaipur in Madhya Pradesh. The unit, with a capacity to produce 100,000 tonnes per year of this plastic, will be commissioned in 1992.

Executives of Ferruzzi Montedison group told newsmen at New Delhi on November 13 that Technimont has also signed an agreement with DCL Synthetics and Chemicals Limited to set up a 12,000 TPY acrylic fibre unit in Maharashtra.

They said that the group is interested in setting up polypropylene and high density polyethylene (HDPE) downstream units of Haldia naphtha cracker complex. It is also exploring possibilities of transferring HDPE technology to GAIL's Auriya gas cracker project.

It will also consider setting up downstream plastic units at the Vizag naphtha cracker project of UB group. Farmitalia Carlo Erba, a drug company of the group, is holding negotiations with the UB group for technology transfer and equity investment in a project for production of some life-saving drugs. It currently markets its drugs through a UB group company.

FICTEC, another group company, has recently signed a technology transfer agreement with Haryana Glycines Limited, a joint venture between Facor group and Haryana State Industrial Development Corporation, for setting up a phenyl glycine unit in the state. Phenyl glycine is an intermediate for production of antibiotics.

Technimont has set up a joint venture engineering firm with Industrial Consulting Bureau. Named Technimont India Private Limited, the company will bid for engineering contracts in the country as well as abroad.

Technimont, which built several fertiliser plants in the country during the sixties and seventies, is also interested in offering its new energy-saving urea technology to the fertiliser industry.

BASF POLYSTYRENE PROJECT PLAN STAYS

BASF India Ltd. has denied reports that it is abandoning its project to set up a 50,000 tonne grassroot polystyrene project at Mangalore. Mr. M. Balasubramaniam, director of BASF plastics and fibre intermediates division told *The Economic Times* that the company's

letter of intent would be converted into an industrial licence within the stipulated time. Land for the project had been acquired and the project was progressing without any hitch. He also denied that BASF AG, the parent company, had lost interest in the project.

Meanwhile, the company has recorded satisfactory half-yearly performance. Sales and profit before tax for the first six months of the current year are Rs. 468.6 million and Rs. 54.4 million respectively as against Rs. 422.6 million and Rs. 45.3 million of the corresponding period last year. The company attributed the improved performance to higher capacity utilisation, steps taken under the ongoing profit improvement programme and introduction of new high value added products. The company achieved an export turnover of Rs. 22 million and has substantial orders on hand for exports of agrochemicals to west Europe.

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Major decisions soon on petroleum front

The Government is expected to take some major decisions on the petroleum front in the coming months, according to oil industry sources. The oil industry has attached considerable significance to the high level meetings that the Petroleum Minister, Mr. Satya Prakash Malaviya, had with the Petroleum Secretary, Dr. Madhav Godbole, and the Oil Co-ordination Committee Executive Director, Mr. R.K. Narang, and senior officials of oil companies in the last two days.

While official sources described the meetings as review meetings of the situation on the petroleum front, industry sources said the meeting could be a run up to an exercise towards important decisions on the petroleum sector. Some of these, the sources said, could relate to IMF borrowing under the Compensatory Contingency Financing Facility (CCFF) where an oil import component is likely to be introduced to ease the economic burden for Third World countries hit by the Gulf crisis, additional imports of petroleum products to meet the rising demand and perhaps take a second look at the conservation measures.

Diesel supply to improve

The availability of diesel is expected to improve within seven to ten days as fresh import consignments are expected

shortly and the sudden spurt in demand from the agricultural sector would ease, official sources said. Most parts of the country including the metropolitan cities of Delhi, Madras, Calcutta and Bombay have been experiencing 'restricted availability' and long queues have been seen at the petrol pumps for the past ten days.

The Government has already despatched additional supplies of about 50,000 tonnes of high speed diesel (HSD) recently to ease the pressure on retail outlets and expects import consignments of 125,000 tonnes of HSD to arrive before November end and another 560,000 tonnes in December. Government denied there was any shortage of diesel but only "restricted availability" because of the 10 per cent cut in supplies as part of conservation measures and the spurt in demand from the agricultural sector in the wake of the rabi sowing season now at its peak.

The 'so-called shortage' could be the result of a sectoral imbalance as the Government has given top priority to meet the demand for diesel from the agricultural sector now which has also shown a sudden spurt, sources said. As a consequence of both the 10 per cent cut and diverted supplies to the agricultural sector, there is a temporary supply-demand gap in the transport

Mr. Satya Prakash Malaviya will head the Ministry of Petroleum & Chemicals. Mr. Jai Prakash will be Deputy Minister in the Ministry.

sector. HSD is being used in the agricultural sector to both run the pumpsets and the tractors for irrigating the lands.

The annual demand for diesel is about 20 million tonnes and of this 16 million tonnes comes from indigenous sources and four million tonnes is imported, the sources added. Diesel accounts for 38 per cent of consumption in the petroleum basket of middle distillates. The middle distillates together account for about 58 per cent of consumption of all petroleum products. Petrol, a light distillate, represents only 6.8 per cent of the total consumption of petroleum products in the country.

The Government, the sources said, is making all efforts to ensure adequate supplies to the States particularly, Punjab, Haryana, Bihar, Rajasthan, Gujarat and West Bengal and Madhya Pradesh where the demand for diesel has been high.

Because of the rabi sowing season reaching its peak between mid-November to December first week demand for diesel can go up by an additional 45 per cent, the sources added.

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Tata Chemicals to set up plants in Gujarat, Madhya Pradesh

Tata Chemicals Limited is planning to set up a cement plant at Mitapur in Gujarat. The company also proposes to set up a plant at Pithampur in Madhya Pradesh for the manufacture of detergent material based on the use of a unique variety of soda ash developed by itself.

The cement project at Pithampur will have a capacity of 2.50 lakh tonnes of ordinary portland cement or three lakh tonnes per annum of pozzolana portland cement and will be founded on considerations of environmental improvement, utilisation of waste materials, and energy efficiency of the company. The detergent project would help the company to recapture the market for the domestic use of soda ash.

Although the company has announced the diversification project, it has not indicated the likely investment in these new projects. Meanwhile, the company's fertilisers project has achieved an overall progress of about 25 per cent towards implementation involving actual expenditure of Rs. 71 crores and a commitment of Rs. 165 crores.

The company's rights issue of partly convertible debentures and non-convertible debentures has opened on November 1, and will be closed on December 7. The public issue of debentures will open on December 10.

The company has shown a modest increase of 11.2 per cent in its gross profit for the first half of the current financial year. It has earned a gross profit of Rs. 45.02 crores for six months ended September 30, 1990 against Rs. 40.48 crores for the corresponding period of the previous year.

Its sales and other income have amounted to Rs. 158.75 crores against Rs. 147.37 crores. The net profit amounts to Rs. 28.48 crores against

Rs. 24.34 crores, an increase of 16.6 per cent. The net profit has been arrived at after depreciation provision of Rs. 10.54 crores (Rs. 8.95 crores) and tax provision for Rs. 6 crores (Rs. 7.10 crores).

For the whole year of 1989-90, the company earned a net profit of Rs. 40.74 crores on sales of Rs. 309.03 crores.

DECKS CLEARED FOR HALDIA CARBON PROJECT

With the signing of the agreement for the Rs. 65-crore carbon black project in the joint sector at Haldia, an enterprise of international standard is now set to become a reality.

The private partner for the project would be Dunlop India Limited (DIL), while in the private sector, the West Bengal Industrial Development Corporation (WBIDC) — the state's premier industrial development agency — would participate.

The two partners signed an agreement recently to start the project which was planned in 1989 as part of DIL's diversification plan. The cost was initially estimated at around Rs. 50 crore. Over 600 people would be provided direct or indirect employment by the project which would have an annual capacity of 50,000 tonnes.

The product range includes some import substitution items. The project, to be set up in collaboration with J.M. Huber of the USA, would have state-of-art technology and be internationally competitive in efficiency and technology, according to DIL sources.

They said that marketing services, including pre-and post-sale technical assistance, would be offered to help particularly the small and medium-scale consumers. The WBIDC which acts as

the nodal agency in the state for promoting medium and large-scale industries, the participation in the carbon black project was part of its contribution to the industrial growth in West Bengal.

The agency, the assistance package of which includes among other things, loans and direct participation in share capital, is also a participant in the Haldia petrochem project.

The Memorandum of Understanding (MoU) of the project between the WBIDC and the DIL was signed in 1989.

In addition to the complete range of blacks for the rubber industry, the project, after going into production, would also be a backward integration for the DIL enabling it to use its own products as raw materials. The project is expected to follow the usual joint-sector equity pattern, DIL sources said.

SOVIET KNOWHOW TO TURN RUBBER INTO DISPOR

The Soviet Union has developed a technology for converting old rubber into dispor in powder form.

Dispor is useful in making tread rubber for diagonal and radial motor tyres. Dispor, which can be seen at the Soviet pavilion at the India International Trade Fair in Delhi, helps in getting rid of old tyre stockpiles of tyres.

A distinctive feature of the manufacture of dispor is that an intermediate product at one of the final stages of process is water-dispersed rubber resembling latex in its properties. This can be used a source material for making protective coatings for metal and concrete structures. --

Besides, it can be used to plug boreholes, replacing costly latex currently used for the purpose.

Steep rise in soda ash price

Soda ash, a vital chemical needed by a host of industries, has become dearer. It is not that the producers have increased the prices. What they have done is simply to withdraw the customary discount of Rs. 300 or so per tonne and resort to supply of this material at list prices which now range from Rs. 3,220 to Rs. 3,240 per tonne. The reason for this action is said to be increase in the cost of freight, packaging and production.

The first to stop the discount was Gujarat Heavy Chemicals Ltd. (GHCL) and then others, including the leader Tata Chemicals, just fell in line, according to market circles.

They say that there is also a proposal, by GHCL to increase the list price, but what is holding up the decision is the strike of the loaders which has prevented the company from despatching goods to consuming centres. As soon as this problem is resolved, the company will raise the price and others may follow the action, the sources say.

They are, however, sceptical whether any price increase at this stage, coming on top of the abolition of the discount, will be absorbed by the consumers. The present demand-supply position is finely balanced, both producers and dealers agree, and therefore it is felt that the system of discount may be revived sooner or later to encourage the offtake.

Production of soda ash during 1989-90 increased to 14.02 lakh tonnes (12.27 lakh tonnes in the previous year) as against the industry's installed capacity of 15.496 lakh tonnes. However, the offtake was not commensurate with the rise in output and therefore the industry was left with a carryover stock of 1.19 lakh tonnes on March 31, 1990.

Taking into consideration the proposed output of 15 lakh tonnes during the current fiscal year, the total availability would rise to 16.19 lakh tonnes

compared with 14.70 lakh tonnes in 1989-90.

Consumption during the year is reckoned at 14.59 lakh tonnes as against 13.51 lakh tonnes in the previous year. Thus, there would be a surplus of 1.60 lakh tonnes to be carried over to the next year. The producers are trying to tide over the problem of inventories by resorting to exports and have achieved some success in that direction.

But the international prices are currently quite unremunerative and therefore active government assistance by way of fiscal measures will be necessary to step up exports significantly.

The manufacturers were enjoying a CCS of 5 per cent on soda ash exports till recently, but the same was withdrawn. Representations have already been made for restoring the CCS.

— Business & Political Observer

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The Bombay University Department of Chemical Technology is pleased to announce that it has installed a fax machine no. 91-22-4114366. This has come through the kind assistance of M/s. Polyolefins Industries Ltd., through the courtesy of UDCT Alumni Association.

ACORNS CLEAN WATER

A team of Korean scientists have developed a process for separating heavy metals and uranium from waste water by using a derivative of the lowly acorn, the seed of an oak tree. The Korea Advanced Energy Research Institute (KAERI) reported that its researchers have discovered that "acornic acid" extracted from acorns can reduce the radioactivity of water contaminated by uranium to a "non-detectable" level.

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NCL, 3 cos join hands to improve LAB technology

The Pune-based National Chemical Laboratory (NCL) has initiated talks with three petrochemical units for a joint programme to further develop the manufacturing process of linear alkyl benzene, (LAB).

The three petrochemical units are Indian Petrochemicals Corporation Ltd. (IPCL), Reliance Industries Ltd. (RIL) and Tamil Nadu Petrochemicals.

Revealing this at a talk on "Cooperation between industry and research institutions" organised by the Bombay Chamber of Commerce and Industry at Bombay on Nov. 15, NCL director, Dr. Ramesh A. Mashelkar said, such cooperation within the industry to work on a common programme would go a long way in a developing industry in India — which is always facing a resource crunch. Dr. Mashelkar, however,

declined to give any details of the LAB project saying it would be premature to say anything on the outcome of it.

Speaking at length on NCL's contribution to industry, Dr. Mashelkar said it has developed a unique process of manufacturing ethyl benzene using dilute alcohol at Hindustan Polymers last year. Hindustan Polymers has now signed a contract with a US based company for transfer of this technology, he added.

NCL's has also worked on "drag reducing polymers". Initially in 1986, when it first took the process for manufacturing linear HMW polymer the effort revolved about concentrating 900 parts. Subsequently, the concentration of parts was cut to 500 in 1987. In 1988 it devised a self-assembling technique thereby reducing the concentration of

parts of 50 with scope for further reduction. Some of these polymers are to be tested by the Indian Oil Corporation.

Recently, NCL has developed with the cooperation of Bajaj Auto a rotor fan for scooters using industrial plastics, as against aluminium which is currently used. It has also developed a few products with the Kirloskars.

NCL, which has been chosen as consultant to the Chinese chemical industry, will soon intensify its consultancy services overseas.

He felt that though India spent about Rs. 14,000 crore of R and D which accounted for 1.1 per cent of the country's GNP, industry as a whole spent about 20 per cent while 80 per cent is being spent by the government.

This equation, he felt, should change and at least half of the R&D expenditure ought to come from industry by '95.

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ICMA to set up technology data bank

The Indian Chemical Manufacturers Association proposes to set up and maintain at the behest of the Government, a data-bank on the latest and proven technologies in organic and inorganic chemical manufacture. Announcing this in an exclusive interview to CHEMICAL WEEKLY, Mr. Hero J. Chuganee, who took over as President, ICMA, in October this year, made a fervent plea to policy makers to permit chemical manufacturers to benefit from economies of scale by expanding to economic capacities. Excerpts from the interview:

CHEMICAL WEEKLY (CW): The chemical industry is almost universally perceived as a polluting industry. What steps do you think that the Chemical Industry in general and the ICMA in particular can take to correct this perception.

HERO CHUGANEE (H.C.): Well, the pollutants are created by the industry, but the industry is organised and capable of tackling this problem; and safely discharging effluents into the environment. Pollution is also caused by the user industry and ICMA and its members intend to train end users for judicious use of the chemicals through workshops, seminars, literature and MSDS sheets.

CW: There nevertheless seems to be a communication problem between the industry and the public at large -- the public at large still views the pollution problem as emanating from the chemical industry. As an association, how do you propose to bridge the gap?

H.C.: This is a herculean task, and to this end I have established a special sub-committee -- Public Relations and Fund Raising Committee. This committee will emanate the view to the public that the industry is a responsible one, and while it does create pollution it has the ability to tackle this problem.

As a matter of fact we have another sub-committee which is the Safety, Health and Environment sub-committee, which was earlier headed by Mr. Punshi of Hindustan Lever Ltd., and now has Mr. Venkatesh from NOCIL, as the Chairman and Mr. Marphatia, the as co-chairman. We have commissioned a person to prepare the MSDS sheets for all chem-

icals. There is a recent notification from the government listing some 350 chemicals. We are working on a 150 chemicals and are almost ready with that and plan to move on to the remaining 200 shortly. These data sheets will be available both in floppy and booklet forms to the industry.

CW: Has a part of it been already released?

H.C.: They were, in an earlier format but with the new stipulations the format has been modified and we have also modified the data sheets to suit the format the government requires.

CW: What other kind of plans do you have for ICMA?

H.C.: The government has recognised ICMA as the apex body (representing the chemical industry) and they have confidence in this association. The government has recently introduced a scheme, TIFACLINE in which the government is willing to make an initial investment on hardware - computers etc., which they will run for the first year. Thereafter they (the government) would like ICMA to take-over. Now, paying Rs. 5-6 lakhs every year from the amount we collect from membership will not be viable, so there are two options: either we increase the membership fee, and if we increase this fee we must be able to provide some additional services to the members, or we set up a corpus of Rs. 30-50 lakhs, and use the interest out of it to meet the expenses of running the project. The Committee, I referred to, will make an effort at fund raising, for raising the corpus.

CW: This is going to be a technology

database that you are going to be maintaining?

H.C.: Yes, that is right.

CW: When do you think this will get going?

H.C.: Well, in the next six months or so. We have already informed the government that we are interested in this. We have a year and a half to get things organised -- for a year the government will pay and subsequently we will have to take over.

We have in fact written to Mr. Murthy, Advisor in the Department of Petroleum and Chemicals confirming we will avail of the offer to set up a TIFACLINE data bank for organic and inorganic chemicals at the ICMA headquarters in Delhi. The main objectives of the project is to provide information on

- commercially proven industrial technologies in India and abroad;
- commercially proven industrial technologies for better utilisation of indigenous raw materials; and
- trends in the future of this technology. These services are going to be provided via --
- access to TIC's own database;
- access to foreign database;
- access to other sources of information.

Since the TIC will be involved in several links of the information chain generally it is in addition also going to

- undertake on-line retrieval on behalf of other parties (information broker);
- assist user in getting copies of references for document delivery;
- provide users access to its stock of important journals, magazines, catalogues, etc.
- to give users advice on where to look

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- SDI Profiles in selected data base
- Technical journals and magazine
- Conference proceedings
- Manufacturers catalogues
- Foreign collaboration application, etc.

CW: What kind of strategies do you think are relevant to the big industries and the small ones. The kinds of problems particularly with respect to pollution in the two industries are so different.

H.C.: The MSDS sheets that ICMA are preparing, are particularly relevant to the smaller companies who do not have the resources. A company like mine, has already prepared data sheets for the chemicals we are handling, and is not likely to go to ICMA for that. When you mention the small companies which do not have the resources or the technical skills available, for them this will be the right thing.

CW: Today, amost every part of the chemical industry has it's own association -- whether you take pesticides, fertilisers, dyes, drugs, plastics etc. Does this lead to conflict? If views being set up to the Government particularly with regard to policy framing. What is the role of ICMA in this framework.

H.C.: ICMA has members from all parts of the industry. We have plastic manufacturers as members, as well as suppliers of raw materials to them as

members; pesticide manufacturers are our members and so are chemical suppliers to these pesticide manufacturers. When ICMA looks at a problem, we look at it both as a user and a manufacturer. So we have to take a balanced view of both, and make recommendations. Whereas for the other associations, say the pesticide industry, they are naturally interested in safe-guarding the interests of the pesticide industry. Or if it is a plastic manufacturers association, they are not interested in the problems of suppliers of chemicals.

CW: Does this lead to any kind of confusion in decision-making?

H.C.: We have a sub-committee which is called the Development & Planning Sub-Committee. When any problem of this nature comes, it is first referred to this committee who arrange a meeting between the user and manufacturer, and hears both the views. Then the committee debates on them and makes a suitable recommendation which the committee feels is in the interest of the industry. It may take a little longer to decide at ICMA but when we make a recommendation we try to be fair with both, as both are our members.

CW: What kind of policy do you envisage for efficient utilisation of our natural gas resources?

H.C.: We have to hurry on with projects where this (natural gas) can be utilised. Our Petroleum and Plastics Sub-Committee is headed by Mr. Anand Swaminathan and we have given them the task of preparing a perspective plan for the petrochemical industry. This will be ready end-December and we are planning to present this at a meeting with Government officials in Delhi, around February.

CW: How badly has the Gulf crisis affected the chemical industry?

H.C.: The crisis has affected the availability of materials following the 25% cut; feedstock prices have also gone up. The chemical industry is a big user of energy, and fuel prices

have gone up. The industry is going through a difficult phase but I am confident we can overcome the crisis. Hopefully this will be a passing phase and won't last for long.

CW: The (then) Minister for Petroleum and Chemicals is credited to have made a statement that even if international prices of crude fall it is unlikely that domestic prices will come down. Comment?

H.C.: Well, as a leading chemical manufacturers association we will certainly take up the matter with the Government. If international prices fall down we will strongly plead with the government to bring down the prices.

CW: What kind of problems do you see in exports in the coming years?

H.C.: If you talk about exports, you are talking about being competitive in international markets. And if this is to come about, we must have plants of economic sizes. We cannot compete internationally with small batch-size plants, particularly because in the chemical industry size does significantly affect the economies of production. Similarly the feedstock availability has to be at international prices, which, of course, if you are an exporter, you can import at that price. But the main thing is economic size plants.

CW: Do you advocate allowing plants smaller than economic sizes to expand at their existing sites?

H.C.: It would be most welcome. However it is a good policy to move away from the big cities particularly for new plants. Backward area development is a sound idea.

CW: How do you think the Supreme Court judgement pinning absolute liability in the event of an accident affected investments from abroad?

H.C.: It has seriously affected the investments particularly from the Americans, who tend to be very cautious. The Europeans on the other hand are still keen to invest in the country.

A rapid wrap-up of what's new in operations, Processes and Products

Recent Progress in Catalytic Technology in Japan

Misono and Nojiri have given an exhaustive and extremely useful account of the Japanese work which is quite laudable. There are many "exclusive" processes that have been developed in Japan. Thus Sumito Chem. Co. has a high activity acid catalyst for *m*-diisopropylbenzene conversion, via oxidation to hydroperoxide followed by cleavage, to resorcinol. The conversion of propylene to acrylic acid (and likewise isobutylene to methacrylic acid) is well known. There is a direct selective hydration process for C₄ fraction containing isobutylene where a concentrated aqueous solution of heteropolyacid is used; *tert* butanol is formed selectively. Selective hydrogenation of nitrile rubber in a polar solvent using Pd/SiO₂ (pore size controlled) is yet another process. The vapour phase oxidation of *p*-methoxy toluene to *p*-methoxy benzaldehyde is a very useful process. Asahi Chemical Industries has developed selective hydrogenation of benzene to cyclohexene which in turn is converted to cyclohexanol in a safe way via hydration.

The first asymmetric process for making (+)-2,2-dimethyl-cyclopropane carboxylic acid from alkyl diazoacetate and isobutene with a chiral complex catalyst was developed by Sumitomo Chem. Co. As is well known, Takasago Intl. has a process for *l*-menthol via geranylamine. (*Applied Catalysis*, 1990, 1-28).

Benzene to Cyclohexanol via Cyclohexene

Asahi Chem. Ind. (Japan) has developed a selective hydrogenation catalyst for benzene which gives a mixture of cyclohexene and cyclohexane and this can be taken for hydration to give cyclohexanol. This is considered to be a cheaper and safer process compared to the solute based on air oxidation of cyclohexane. (*Chem. Eng.*, 1990, 97, No. 10, Oct., p. 25).

Membrane Cells for 50% Caustic Soda

Asahi Glass Co. (Japan) has developed a zero-gap membrane electrolyser with a proprietary layer on the cathode side to give 50% NaOH compared to the current level of 30% (or at the most 35%). (*ibid*, p. 19).

A New Phase Transfer Catalyst (PTC)

Chinese scientists have reacted tetrabutylammonium bromide with propylene oxide, in the presence of sul-

phuric acid to give Bu₄N·O₃SOCH₂CH(OH)Me which seems to work as a good PTC. (*Chem. Abstr.*, 1990, 113, 114596).

Iodophenols by an efficient and selective method

Edgar and Falling have developed an elegant method which uses sodium hypochlorite and sodium iodide in aqueous alcoholic medium to give selective iodination. The *p*-to *o*-selectivity is very high and the ratio of isomers, even with phenol, could be 8. It is even more interesting that by using an equivalent amount of NaOH, further iodination of the *p*-isomer is prevented as being more acidic it is converted into ionic form. This procedure is also probably amenable for separation of isomeric/non-isomeric mixtures of phenolic substances. (*J. Org. Chem.*, 1990, 55, 5287).

Chlorination of aromatics: Side Chain or Ring with Zeolites and Sulphuryl Chloride (SC)

Delaude and Laszlo have shown that the use of SC in the presence of zeolite ZF 520 gives ring chlorination. By contrast zeolite NaX (BX) promotes side chain chlorination in the presence of a light source. The catalyst can be used many times without loss of activity. Toluene was used to test the above procedures which really show remarkable shift in selectivity. (*J. Org. Chem.*, 1990, 55, 5260).

Synthesis of 2,4,5-trifluoro benzoic acid (TFBA): An intermediate for quinoline antibacterials

O'Reilly et al of Occidental Chem. Corp., USA, have shown that tetrachlorophthalic anhydride can be hydrolysed to give 2,4,5 trichlorophthalic acid which is then converted to *N*-methyl or *N*-phenyl phthalimide and subsequently subjected to HALEX with KF in sulpholane; the fluoro compound so obtained is then hydrolysed to give the trifluorophthalic acid and finally via decarboxylation to TFBA. (*SYNLETT*, 1990, 1, No. 10, 609).

Ketone from aldehydes and olefines

Mitsui Petrochem. Ind. have claimed in a Japanese Patent that di-*tert* butylperoxide catalyses the reaction between, say, acetaldehyde and 2-butene to give 3-methyl-2-pentanone in 70% yield. (*Chem. Abstr.*, 1990, 113, 131573).

Alkylation of isobutane/isopentane with C₃₋₄ olefins with zeolites

IFP has claimed that beta zeolite catalyses this reaction to give substances like trimethylpentanes and dimethyl hexanes. (French P. 2,631, 956, Dec. 1989).

Optically active fluoroalkanoic acid (FAA)

It is claimed in a Japanese patent that 2-Fluoro-1-alkanol can be oxidised with KMnO₄ with racemization in aq. H₂SO₄-acetone medium. (*Chem. Abstr.*, 1990, 113, 131577).

Particle gels

Gels are soft, gentle, succulent materials and constitute a part of a number of items of daily life like yoghurt, cheese, paint, sewage sludge, many medicinal compounds, etc. Dickinson has defined gel as "a soft, deformable elastic solid made from a connected network of particles or large molecules". Dickinson has given a very nice account of this subject and has shown how certain theoretical concepts can be useful in understanding why gels form in some colloidal systems but not in others. It is interesting to note that a small change in composition of a commercial product may lead to a large change in properties when one of the components present becomes involved in gel formation.

Computer simulation is proving a valuable tool and using fractal geometry and percolation theory attempts are being made to predict the onset of gelation and to understand the structures of particle gels. (*Chem. Ind.*, 1990, No. 19, 1 Oct., 594).

Purification of terephthalic acid (TPA) by crystal ageing

Brown et al have studied the rate of removal of 4-carboxybenzaldehyde (4-CBA) from TPA crystals during crystal ageing in both aqueous solutions and 90% acetic acid (10% water). Over 50% CBA could be removed by ageing by 2 hour at 220°C in 90% acetic acid. (*Ind. Eng. Chem. Res.*, 1990, 29, 2089).

Reaction of hexachlorocyclotriphosphazene (HCCTP) with 2,2,2 trifluoroethanol (TFE)

Wang and Wu have subjected the reaction under reference to phase transfer catalysis, with the catalyst tetra-n-butyl ammonium bromide. This reaction, with chlorobenzene as a solvent and NaOH is the aq. phase, is both chemical kinetics and mass transfer controlled. (*Ind. Eng. Chem. Res.*, 1990, 29, 2137).

Benzyl toluenes

Bayer has claimed that toluene can be reacted with benzyl alcohol with activated clay like Tonsil K-20 at 110°C to give 90% + yield of benzyl toluenes. (Ger. offen DE 3,836,780, May 1990; *Chem. Abstr.*, 1990, 113, 131707).

Poly-(4-acetoxystyrene) (PAS)

Hoechst-Celanese has claimed that phenol can be acylated in para position with AC₂O and then -OH is converted to -OAc and the product hydrogenated to give the carbinol which in turn is dehydrated to AS and subsequently polymerised. (E.P. Appl. 355,983, Feb. 1990; *Chem. Abstr.*, 1990, 113, 133033).

Moisture removal with hollow fiber membranes (HFM)

Mitsubishi Kasei Corp. has claimed that natural gas can be dried through a HFM which shows a relative selectivity exceeding a factor of 500. (*Chem. Abstr.*, 1990, 113, 1135056).

Diarylmethanes (DAM)

Aromatic hydrocarbons like toluene can be condensed with HCHO, in the presence of sulphuric acid as a catalyst at 100°C to give DAM; the use of a surfactant like lauryl trimethylammonium chloride reduces the yield of higher condensates considerably. (*Chem. Abstr.*, 1990, 113, 131711).

2-Chloro-4-toluenesulphonic acid (CTSA)

PTSA can be chlorinated in aqueous HCl medium, in the absence of a catalyst, between 0 to 60°C, to give CTSA in about 82% yield. (*Chem. Abstr.*, 1990, 113, 131751).

Separation of phenol in the manufacture of salicylic acid

It has been claimed that the product obtained from carboxylation of sodium (alkyl) phenate, containing phenolate, sodium (alkyl) salicylate and phenol can be subjected to separation in membrane system (e.g. based on poly (dimethyl siloxane); xylene was used as a solvent. In this separation sodium (alkyl) salicylate does not permeate. (E.P. Appl. 370,555; *Chem. Abstr.*, 1990, 113, 131732).

Terminal chlorination of normal alkanes

It has been claimed that terminal chlorination of normal alkanes like, say, n-nonane, can be conducted photo-

chemically with Cl_2 provided pentasil type zeolites (e.g. ZSM-5 or ZSM-11) are used. (*Chem. Abstr.*, 1990, 113, 114631).

Diphenylalkanes

Ethyl Corp. (USA) has claimed that benzyl chloride at 85°C and in the presence of iron powder (which contains Cu and Cu (I) salts) gives $\text{PhCH}_2\text{CH}_2\text{Ph}$ in 73% yield. (U.S. 4,929,789, May 1990; Cf. *Chem. Abstr.*, 1990, 113, 114790).

Absorption of O_2 into aqueous alkaline suspension of ferrous hydroxide

Sada et al., have studied this reaction in the context of making fine goethite and magnetic particles, which are widely used in practice. The initial particle size of ferrous hydroxide is 0.02 to 0.03 microns and is very much smaller than diffusion film thickness. A bubble column with a draft tube was used. Experimental data have been composed with the theoretical model which recognises solid dissolution as a parallel step in the diffusion film. Enhancement factors of around 3 have been realised. (*Chem. Eng. Commun.*, 1990, 95, 145).

Recovery of SO_2 from flue gas (FGD) with aqueous amine solutions

Union Carbide, Canada, has developed an absorption process, based on an aqueous amine solution, where the absorbed liquor is regenerated through steam stripping giving pure SO_2 . (*Process Engg.*, 1990, July, p. 24).

Pervaporation for anhydrous isopropanol (IPA) or ethanol (E)

Kalsep has developed hybrid technologies to increase the capacity of existing plants as well as new plants. Thus if the IPA concentration is raised from 87.5 to 89.8% via pervaporation the distillation train can handle 20% extra capacity; the permeate from pervaporation contains less than 1% IPA. In the case of E the distillation column is deliberately operated to give sub-azeotropic composition of 92.6% which allows a reflux ratio of 2:1, rather than 4:1. The 92.6% E is subjected to pervaporation. (*Process Engg.*, 1990, July, p. 31). In IPA azeotropic column the overhead temp. is 96°C and thus provides energy for interstage heating requirements for pervaporation.

Vanilla through extraction with supercritical CO_2 (SCC)

Supercritical Processing, a unit of Liquid Carbonic Ind. Corp., Pa., USA, claims that the SCC based vanilla is

now competitive with the established process. A superior extract is obtained with higher yields; in SCC based process no distillation is required. (*CMR*, 1990, 15 Oct., p. 41).

A simplified approach to the operation of a batch crystalliser (BC)

BC's are widely used in the production of speciality chemicals. The size of the product crystals and the rate of production depend on seeding and the rate of cooling. Rigorous models are needed to determine optimal cooling/seeding policies. Rohani and Bourne have proposed a simple approach, both for size dependent or size-independent growth rates, to provide temperature-time trajectories and this has been verified experimentally. (*Can. J. Chem. Eng.*, 1990, 68, 799).

Hydrogen peroxide from Hydrogen (H) and Oxygen (O)

H and O can be reacted directly, as per claims and practice of Du Pont, in the presence of Pt and/or Pd on C, SiO_2 or Al_2O_3 , with H^+ and Br^- ions each at concn. of 0.001 to 0.05 M in aq. medium. A proprietary organic compound at 2% level is used which reduces the explosion hazard. (E.P. Appln. 342,047A; Cf. *Plat. Metals Rev.*, 1990, 34, 170).

Removal of dissolved oxygen from water

Bayer has claimed the use of anionic macroporous resins, partly replaced by Pt or Pd, which allows the removal of O_2 with hydrogen giving low residual oxygen. (E.P. Appln. 345,822A; Cf. *Plat. Metals Rev.* 1990, 34, 170).

Catalytic distillation (CD) for MTBE and other compounds

Catalytic Distillation Technologies have shown CD gives 90% yield of TAME, which is 15% higher than in the conventional system. ETBE has also been made. Very soon ethyl benzene manufacture will be possible with a Zeolite Y as the catalyst cum packing. (*Chem. Eng.*, 1990, 97, No. 9 (Sep.), p. 17).

Plastic packings for cooling towers

Johnson has described the recent work of CEGB (and now Power Gen and National Power) in U.K. for change over from the original timber/asbestos sheet packings to plastic packings in natural draft cooling towers (NDCT). These new cooling tower packings fall in the category of structured packings and can bring down the temperature of water by 2.5 to 3.3°C. A typical NDCT in a large

power station is typically 86m in dia. at the bottom and 50m at the top with a height of 114m. This tower handles 8.5 cu m/s of water and 6000 cu m/s of air. Water distribution should be proper. This changeover has been found to be economically attractive. (*Chem. Engr., Instn. Chem. Engrs., U.K.*, 1990, No. 478, 26 July, p. 18).

The Rh-catalysed deuteration of unsaturated triglycerides (UTG)

ADLOF has shown that Wilkinson's catalyst $[(\text{Ph}_3\text{P})_3\text{RhCl}(\text{I})]$ can be used to deuterate UTG with deuterium; deuterated UTG is used for study of fats in human metabolism. There is no Rh in the product at the minimum detection level. (*J. Am. Oil Chem. Soc.*, 1990, 67, 52).

Naphthalene formaldehyde sulfonates (NFS) as superplasticisers for concrete

Lignosulfonates are extensively used in concrete admixtures. Now NFS are being used as these not only increase the flow properties of concrete, but also permit the manufacture of high strength concrete with less cement than previously required.

Apart from higher tensile and flexural strength, superplasticisers also provide lower permeability to chlorides and water, which is important in parking decks and bridge and highway structures. Superplasticisers are used in USA anywhere the strength is over 4000 psi. (*CMR*, 1990, 15 Oct., p. 33).

Carbohydrates in the food industry

Carbohydrates form a major part of the human diet; energy is available *in vivo* as the monosaccharide D-glucose, the blood's "instant energy" molecule. In early 70's an important breakthrough came with immobilised glucose isomerase converting glucose to "Sweet" fructose. Even in U.K. one-third of the sweetener is now through the liquid high fructose syrup (HFS). It may be noted that HFS is good for foods and drinks which do not contain proteins or amino acids as glucose and fructose, as reducing sugars, may react.

Enzyme conversions of food carbohydrates should provide a range of new metal chelators and glycosides. Taste and flavour can be created through the use of enzymes.

Dextran is widely used as a filling agent. An exciting possibility is the conversion of sucrose to dextran through the use of the enzyme dextranase; Dutch workers are trying to adopt this in "Yoghurt". (*Barker, S.A., Chem. Brit.*, 1990, 26, No. 7, 665).

Ethylbenzene (EB) and styrene (S) from toluene and methane

Osoda et al in exploratory experiments have shown, with isotope-labelling, that toluene oxidative methanation over a lithium promoted $\text{Y}_2\text{O}_3\text{-CaO}$ catalyst gives EB and S. It seems that a cross-coupling between methyl and benzyl radicals is involved. (*J.C.S. Chem. Commun.*, 1990, p. 1434).

Pd-catalysed allylic oxidation of cyclohexenes with O_2

Bystrom et al have shown that a catalytic amount of Pd acetate converts cyclohexene into the corresponding allylic acetate; reoxidation occurs with O_2 and either hydroquinone and a second transition metal acetate or cobalt (II) Schiff's base complexes; yields are of the order of 85%. (*J. Org. Chem.*, 1990, 55, 5674).

Dimethyl disulphide (DMDS)

A Chinese Patent claims an interesting and useful route for DMDS where Me_2SO_4 is reacted with Na_2S and S and the resultant $\text{Me}_2\text{S}_2\text{-Me}_2\text{S}_3$ mixture is treated with aq. Na_2S . Me_2S_2 is produced in high yields and this is also an intermediate for agrochem 3,4-Me(MeS) $\text{C}_6\text{H}_5\text{OH}$. (*Chem. Abstr.*, 1990, 113, 151,829).

Butadiene to crotanaldehyde

Eastman Kodak has claimed that butadiene can be oxidised with O_2 over $\text{Ag}/\text{Al}_2\text{O}_3$ catalyst with a promoter like $\text{ClCH}_2\text{CH}_2\text{Cl}$ to give crotanaldehyde; activated alumina has a surface area greater than $100 \text{ m}^2/\text{g}$. (US 4,942,263, July 1990; *Chem. Abstr.*, 1990, 113, 151835).

Inverse PTC effect of cyclodextrins (CD): Reactions of benzyl alcohols with NaClO

Hu et al have shown that alpha, beta and gamma CD accelerate, through inverse PTC, the title reaction, yields of 47-89% have been realised. (*J. Mol. Catal.*, 1990, 60, No. 3, L-13).

Alicyclic methacrylates

Mitsubishi Petrochemical Co., has claimed that dicyclopentadiene can be subjected to oxo reaction and the aldehyde so obtained is hydrogenated to give an alcohol which is esterified with methacrylic acid. This ester can be photopolymerised with other co-monomers to give a polymer with heat distortion temp. of 148°C and moisture absorption 0.57%. (*Chem. Abstr.*, 1990, 113, 116063).

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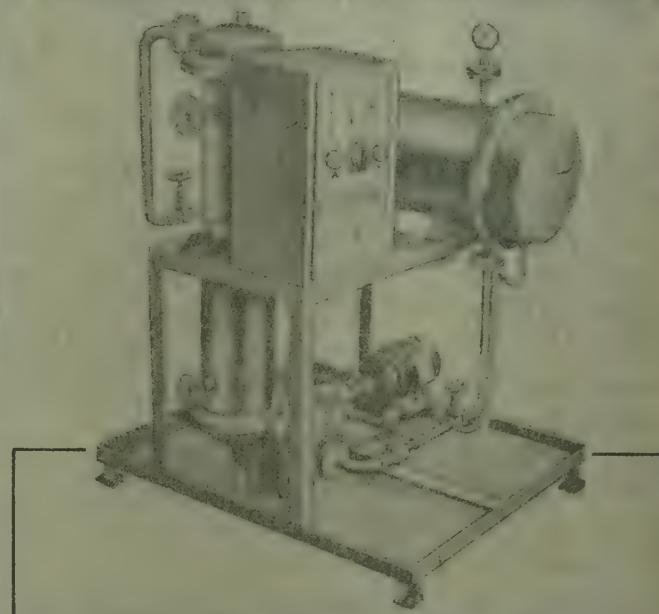
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Kolmak Chem. to raise output

Kolmak Chemicals Ltd., which has a unit at Kalyani in West Bengal, expects to realise higher levels of production by the year-end as the project work for doubling of installed capacity for its sole product — titanium dioxide anatase — nears completion.

The doubling of capacity is part of the scheme of revival of the company sanctioned by Board for Industrial and Financial Reconstruction (BIFR) and financed by a team loan of Rs. 1.4 crore from Industrial Reconstruction Bank of India (IRBI).

The management of the company is optimistic about the future as it has developed a special grade of titanium dioxide anatase named KCL-3001. L, which has superior properties compared with other grades available in the market. The product, which is expected to be highly popular with the plastics, rubber and textile industries, would ensure better price realisation in the future.

The company's technical team has made considerable progress in the development of rutile technology. The project report for production of 2,700 tpa of rutile grade pigment by addition of downstream surface treatment facility is under preparation. In view of higher profitability in manufacture of rutile grade pigment, the project would be taken up for implementation on completion of the on-going scheme.

Meanwhile, for the first time since its inception 12 years ago, Kolmak has recorded an operating profit of Rs. 33.98 lakhs thanks to a capacity utilisation level of 68 per cent achieved at its Kalyani plant. Volumewise, the company produced 810 tonnes of titanium dioxide anatase against an installed capacity of 1,200 tonnes. The company's turnover in the financial year rose impressively from Rs. 2.19 crores in the accounting year ended March 31, 1989, to Rs. 4.65 crores in 1989-90, accord-

ing to the report of the company presented to shareholders at its annual general meeting at Calcutta recently.

Supply of rutile grade titanium dioxide may improve

The supply position of rutile grade titanium dioxide, the critical input for the paint industry that is largely imported, could be expected to improve in the near future if the diversification scheme of Kolmak Chemicals Ltd. works out as planned. Kolmak would be taking on a Rs. 5-crore project for the manufacture of rutile grade titanium dioxide at its Kalyani plant, making it the second such unit in the country after the government-run unit in Kerala.

"The plans for the project have been completed. We have even received a positive response from consultants like Mecon who will be doing the detailed engineering work", Mr. H.K. Mohta, director, Kolmak Chemicals, told The

Economic Times. Basically the company's existing Kalyani plant, which produces an anatase grade titanium dioxide at present, will be equipped with a downstream processing facility to produce rutile grade pigment. The capacity of the plant, as envisaged in the project report, would be 3,000 tpa.

Kolmak already possesses the technology required for the conversion process. The only constraint, Mr. Mohta indicated, was finances. Kolmak which was sick for so long is at present being revived by the present management under a BIFR package.

The package is expected to be fully implemented by the end of the current accounting year. Work on the rutile grade pigment production facility would be initiated only after the implementation of the revival package is completed and anatase grade pigment production at the Kalyani plant doubles to 2,400 tpa.

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Packaging cost norms for drug units cut

Packaging cost norms for the drug industry have been cut below the 1979 levels. The Ministry of Chemicals and Pharmaceuticals has advised BICP to adopt packaging material cost norms, which in several cases are even lower than those fixed in 1979, according to a telegram sent by Mr. Kishor Shah, Chairman, Joint Council of Pharmaceutical Industry & Trade.

The decision looks like a parting kick from the departing Union Minister, Mr. M.S. Gurupadaswamy for the drug industry. The industry has not been fairly treated by the Minister and has had its prices cut but despite a liberal 1987 drug policy.

The Government had agreed that the revised 1989 packaging material cost norms will be 50 per cent more over the 1979 levels and at a recent meeting with the industry, Mr. M.S. Gill, Secretary, had assured that there would not be any

dilution. Packaging cost norms are fixed internally by the government without the backing of a notification.

They fix ceiling levels and anything above is pruned. It cannot be anybody's logic that packaging material costs in 1990 are lower than in 1979, as inflation has taken a toll. It implies that drug prices will be further cut when the industry is facing cost escalations. The Drug Prices Control Order 1987 does not contain any provision for fixing norms for packaging material costs, as Paragraph 6 permits only process loss norms to be fixed regularly through notifications.

In July 1989, the ministry had advised BICP to allow packaging material costs by adding 50 per cent to the norms of 1979 and the back pedalling has disturbed drug units. All this comes at a time when the industry has been pressing the government for an across-the-

board 15 per cent hike in drug prices, following the 25 per cent Gulf surcharge. DPCO 1987 does not provide for any such eventually and any mark-up can only be granted after a detailed cost study by BICP. With no minister around, it is difficult to expect officials to take a decision, which means the industry will have to wait a bit before getting its due.

Privately, the industry is happy over the resignation of Mr. M.S. Gurupadaswamy as his zeal was only limited to reducing drug prices without bothering much about availability. Perhaps, drug prices have come down but there may not be any drugs around as units were thinking of cutting back on production.

FULFORD INDIA LAUNCHES NEW CANCER INJECTION

Fulford India Ltd. has launched interferon injection manufactured by its principal Schering-Plough, for use in the treatment of cancer. Interferon was discovered in 1957 in England by two scientists who found that embryonic chick cells exposed to heat-inactivated influenza virus in culture secreted a substance into the culture medium that "interfered" with the replication of live virus in a fresh batch of cells. The substance was hence termed "interferon".

With the advent of genetic engineering, the cloning of human gene for interferon in E. coli was achieved. This facilitated the production of large quantities of human interferon for clinical research.

Three molecules, alfa-2 b (Schering), alfa-2 a (Hoffman La Roche) and alfa-2 c (Boehringer Ingelheim) have been identified and purified to date.

Apart from use in treatment of a range of cancers, interferon alfa 2b is also used in treating chronic hepatitis. Adverse drug reactions of interferon have also been identified.

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High blood pressure starts in the womb

High blood pressure in adult life is directly related to impaired growth in the womb, according to research carried out by the UK Medical Research Council's environmental epidemiology unit at Southampton University in southern England.

In a report to the British Medical Journal recently Prof. David Barker and research team colleagues from the unit say this finding was the outcome of a unique opportunity to study a large group of people whose birth had been recorded in unusual detail more than 47 years ago.

During 1935 to 1943, a record was kept of every woman admitted to the labour ward at Sharoe Green Hospital in Preston, northern England.

Each mother's record included details of previous pregnancies and pelvic measurements, while details of the baby included birth-weight, placental weight, head size and length.

A total of 449 of these babies, now middle-aged men and women, still live in the area of their birth and agreed to take part in a study. The researchers found that high blood pressure and hypertension was consistently present in those who were born small in relation to the size of the placenta.

The relation of placental and birth-weights to blood pressure levels was independent of the any subsequent effects of obesity and alcohol consumption, and found to be similar across all social classes.

It seems that the larger the placenta, the smaller the length to head circumference ratio in the foetus. Prof. Barker commented: "This disproportionate growth is consistent with diversion of blood away from the trunk in favour of the brain."

Redistribution of blood flow to

favour the brain is known to occur in foetuses exposed to harmful influences such as lack of oxygen. Reduced blood flow to the trunk, induced in a foetus that is small in relation to its placenta, could have irreversible consequences, perhaps, by influencing arterial growth."

The evidence is that foetal size is strongly related to the mother's stature and pelvic size. Since a woman's physique depends partly on her nutrition in childhood, the nutrition of girls may be linked to blood pressure levels in the next generation.

The researchers conclude that reduction of blood pressure levels in a population may partly depend on improving the physique and nutrition of girls and women. Prof. Barker commented: "This will reduce discordance between placental and foetal growth which in turn leads to circulatory adaptation in the foetus, altered arterial structure in the child, and hypertension, heart disease and stroke in the adult".

FICOM ORGANICS

The Directors of Ficom Organics have recommended an interim dividend of 20 per cent for the current financial year, absorbing Rs. 25.75 lakhs.

Meanwhile, according to the unaudited working results, the net sales during the six months period ended September, 1990, amounted to Rs. 10.02 crores against Rs. 11.05 crores during same period last year and Rs. 21.87 crores for whole of last year. It has earned a gross profit of Rs. 182.56 lakhs against Rs. 186.43 lakhs for the same period last year and Rs. 359.06 lakhs for the last whole year.

After depreciation (Rs. 42 lakhs against Rs. 38.57 lakhs) and taxation (Rs. 20 lakhs against Rs. 26 lakhs), the net profit amounted to Rs. 120.56 lakhs against Rs. 121.86 lakhs and Rs. 213.70 lakhs for the previous year.

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DYESTUFFS EXPORTS**India's share likely to go up**

The share of exports of dyestuffs and intermediates from non-traditional sources such as China, Taiwan, India and South Korea is expected to grow from the present 37 per cent to 50 per cent by 1995. According to Mr. Y.H. Desai, vice president, Chemical Division, Sandoz India, the share of exports from traditional sources such as Europe, US and Japan is likely to come down from 63 per cent as the seven to eight major manufacturers in these countries will not be ploughing in any more investment in this sector.

India thus, has the potential to increase its present exports of Rs. 530 crores (US \$ 330 million) to Rs. 2,500 crore (US \$ 1,000 million) by 1995, he said. The industry has fixed as export target of Rs. 850 crore for 1990-91. According to Mr. Anil Mehta, president of the Dyestuff Manufacturers Association of India, Indian manufacturers have already effected exports worth Rs. 185 crore in the first five months of the current year. This represents an increase of 40 per cent over the corresponding period last year. In the last four years, exports have grown five times, Mr. Mehta pointed out, adding that Chemexcil, the apex body of the trade, has taken up with the Centre the issue of

providing adequate petroleum inputs to this export-oriented industry at reasonable terms. Mr. Desai and Mr. Mehta were briefing newsmen in Bombay on Nov. 15, on the eve of the one day seminar on "Strategic Action Plans for the Dyestuffs Industry to be held in Bombay.

The seminar is being organised by the Dyestuff Manufacturers Association at the instance of the department of chemicals and petrochemicals. The seminar will be inaugurated by Mr. M.S. Gill, m secretary, department of chemicals and petrochemicals. He is also expected to react to the industry's suggestions and complaints at the end of the seminar. Officials from the ministries of industry, commerce and finance will be attending the seminar. The seminar will discuss four key topics: technology upgradation; cost/economy of production; ecology/safety; and global marketing. A task-force constituted by the association has prepared the strategic action also with the help of industry insiders as well as from professionals from outside. The paper basically contains four components; world market status, strengths and weaknesses of India, target markets, and implementation of the action plan.

FLOAT GLASS PROJECT IN GUJARAT: FIS APPROVE RS. 175-CRORE AID

Gujarat Guardian Ltd. has got the final go-ahead after hanging fire for almost a year. Recently, the financial institutions gave their approval for an assistance of Rs. 175 crores to the Modi proposal for the manufacture of float glass in Gujarat. The project is promoted by Modi Rubber Ltd. in the assisted sector with Gujarat Alkalies and Chemicals Ltd. (GACL). Guardian Glass of the U.S. is the technical and financial collaborator for the project with an equity participation of 40 per cent. This would also amount to a foreign equity capital of Rs. 30 crores. Till recently, Rs. 280-crore project appeared to be jinxed as it was threatened by multiple problems. While uncertainty prevailed on demand estimates for float glass in India, jumbled financial affairs of the Modi family contributed to the confusion over its future. With the Modi clan reaching an understanding on sharing of responsibilities for group's past liabilities, decks were cleared for fresh flow of institutional finances into their group companies. Gujarat Guardian would be the second float glass project to come up in India, on the heels of a similar proposal by Continental Float Glass Ltd.

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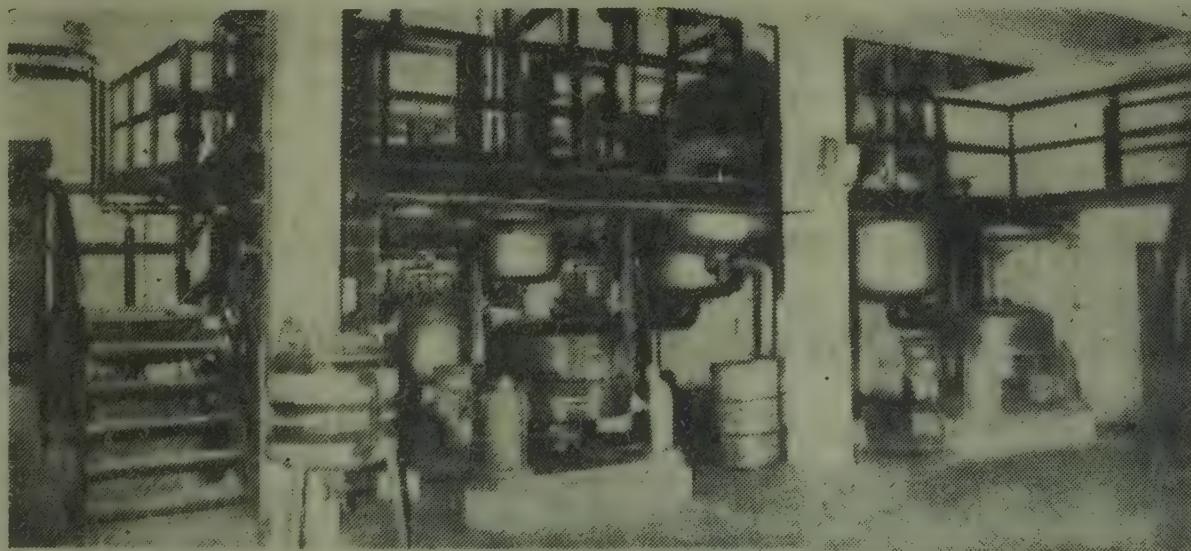
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3 Cos. in race for butyl rubber project

Three big houses are in a race against time and each other to be the first to set up a butyl rubber plant.

The plants being set up at a total investment of about Rs. 900 crores will have a combined production capacity of 75,000 TPA i.e. 25,000 TPA more than the projected demand of 50,000 TPA by the end of the Eighth Plan when the projects are expected to be fully operational. The present demand, according to industry sources is around 35,000 TPA.

The companies — the UB group (which has obtained the licence from VBS Chemicals Ltd.), Modi Rubber Ltd. and the Reliance Industries Ltd. (RIL) are setting up a 25,000 TPA plant each.

The UB group has a little head start over the other two groups as it has obtained the required licences. Their project in all probability is likely to come up first, say industry sources. However, one disadvantage that the UB group is likely to face is the availability of raw material for its cracker plant in Vizag, where its project is to be located.

The UB group would be totally importing MTBE (Methyl Tertiary

Butyl Ether) which would be further cracked into isobutyls for manufacturing butyl rubber.

Thus the projects will be dependent on imports for manufacturing its final product. If the UB group comes out first with its project the race would be between Modi Rubber Ltd. and RIL for the second plant which could be crucial as far as the market is concerned.

However, both companies feel that there would be no problem as the export markets are always open and the domestic market for the product is not likely to stagnate at 50,000 TPA for long, as the product would be basically catering to the ever-expanding automotive tyre industry.

RIL has included this unit among the various downstream projects it has planned in the Hazira cracker complex. This unit was originally estimated to cost about Rs. 221 crores.

However, this project would follow the cracker project. Therefore, the unit is set to come about in the next three to four years time. For the Modis, the road is not very smooth. While they have obtained the industry and petrochemical ministries' clearances, the project is still awaiting approval from the

Cabinet Committee for Economic Affairs (CCEA).

Till this comes through this group can only adopt the policy of wait and watch. The Modi project is estimated to cost about Rs. 330 crores. The company has tied up with a Soviet firm. The plant will be located in Kosikalan near Mathura in Uttar Pradesh.

According to the Memorandum of Understanding (MoU) signed between the two parties, the contribution of the Indian party would be 60 per cent while the Soviet party would contribute 40 per cent of the total equity. Modis have tied up for isobutylene from the Mathura refinery. They have also tied up with PICUP and Indian Oil Corporation for the new material.

The only way for survival for the last project which comes up would be to export, according to experts in this field. However, even in the export market there is a monopoly held by two giants — Polysar and Axel from the US and Canada — which is difficult to break.

The USSR is also a major player in the international market. Polysar and Axel have decided to keep up their monopoly by not setting up units in other countries and providing technological help for any third country project.

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Fertiliser distribution policy flayed

The fertiliser industry is up in arms against the irrational distributional policy being followed by the Union ministry of agriculture. The industry feels that inconsistency in fertiliser allocations is coming in the way of increasing consumption levels further.

The industry is sore over the ministry's failure to adopt a uniform distribution pattern resulting in serious organisational and infrastructure problems for the manufacturers. Besides irregular lifting by institutional agencies, disposal of the increased quantity becomes a difficult task, affecting the companies' image.

Uttar Pradesh is one such state for which higher allocations are being made year after year whereas the actual consumption remains at a much lower level. In 1987-88, for instance, under the Essential Commodities Act (ECA) an allocation was made for 15.1 lakh tonnes of nutrients against the consumption of 11.30 lakh tonnes.

A year earlier, the ministry had made an allocation of 15.80 lakh tonnes. The consumption during the year had not exceeded 13.30 lakh tonnes, leaving a massive surplus of 2.50 lakh tonnes. The same holds true for predominantly agricultural states like Punjab and Haryana.

Considerable deviations are often being made in the allocations to fertiliser manufacturers. For the Rashtriya Chemicals and Fertilisers (RCF), the ministry had made an allocation of 7.32 lakh tonnes of urea to be marketed in UP in 1984-85.

The next year, RCF's share was increased to 32.3 lakh tonnes and a year later to 100 lakh tonnes. And then suddenly in 1989-90, RCF's share was drastically curtailed to 34.4 lakh tonnes and reached a low of 3.99 lakh tonnes in kharif 1990.

For rabi 1990-91, RCF has not been

allowed any share in UP, whereas in Punjab, RCF has been allocated 12.9 lakh tonnes of urea for the rabi season compared to its last year's share of only 10,000 tonnes.

In what appears to be an effort to rationalise the fertiliser marketing policy, the ministry has lately ensured that the allocations are made on the basis of proximity of the plant so that freight expenditures and subsidy are drastically reduced.

For Punjab, which has the highest per capita consumption, there will now be only three suppliers. Besides KRIBHCO, the Panipat and Batinda plants of NFL will market 3.92 lakh tonnes of urea and the Thal unit of RCF 1.29 lakh tones for the current rabi season. Similarly, NFL Panipat, RCF and KRIBHCO will supply 3.80 lakh tonnes of urea for the neighbouring Haryana.

If the fresh allocations are any indication, fertiliser manufacturers like FCI, ICI, Sri Ram, HFC, GNFC, GSFC and SPIC are left with no other choice but to wind up the marketing set up in the northern states.

The fertiliser units are, however, unlikely to shift the marketing infrastructure to their new areas of operations since the ministry continues to rely on ad-hocism.

The industry is hopeful that the ministry might change its decision at the time of making allocations for Kharif 1991. And if that happens it would be difficult for the manufacturers to stage a comeback once the infrastructure has been folded up from the North.

To reduce inhouse competition and duplication of promotional efforts, the ministry has demarcated the area of marketing operations of the two fertiliser giants in the cooperative sector — IFFCO and KRIBHCO. As per the

ministry's new directive, IFFCO will no longer be marketing nitrogenous fertilisers in Punjab, Haryana, Himachal Pradesh, Madhya Pradesh, Andhra Pradesh, and Tamil Nadu, KRIBHCO will be the sole supplier from the cooperative sector in these states. The NFL will be the only supplier for Jammu and Kashmir. It however remains to be seen how long the policy is adhered to.

Still worse is the situation when the institutional agencies refuse to lift stocks at the time of glut forcing the manufacturers to sell to the private trade. Knowing that the industry cannot raise its voice the State governments also reshuffle the agencywise allocations. Recently, the UP department of agriculture had reassigned almost all the allocations of IFFCO and KRIBHCO to cooperative and other institutional agencies, only to be withdrawn a few days later and reallocating it to the private trade.

The institutional agencies are supposed to lift one-sixth of their quota every month. But in practice they avoid lifting during the lean selling months and become active only at the time of a deficit. It is for this reason that the share of institutional agencies has gone down from 100 per cent in the early fifties to 35 per cent in 1989-90.

Despite special considerations shown by the states to institutional agencies, the private trade has emerged as a strong distribution channel.

Yet another factor that is hampering the equitable distribution of fertilisers is the near stagnation in the sale points.

In spite of an overall good performance marketing, there has been no corresponding increase in the number of new sale points. Moreover, the depots are mostly in the urban areas. For instance in Punjab 71 per cent of the sale depots are located in the urban areas or in major mandi towns.

Rs. 100 cr. phosphatic fert. import cleared

The Union government cleared import of Rs. 100 crores of phosphatic fertilisers, while the actual import need was worth Rs. 500 crores for the rest of the financial year. Lack of sufficient foreign exchange has been forwarded as the reason for severely curtailing imports.

This means that phosphoric acid-based fertiliser units around the country face the prospect of remaining closed for most part of the remaining year. It would be the third year in succession that this is happening. To make matters worse, the government is yet to decide on whether the funds sanctioned should be utilised to import phosphoric acid or for the end product, which is di-ammonium phosphate (DAP). Reportedly, the relative price movements of phosphoric acid and DAP in the international market have been such that imports of DAP would mean a net foreign exchange savings for the country.

Estimates based on international prices ruling in the third week of October show that import of phosphoric acid would be a little cheaper than bringing in DAP. The CIF prices of DAP, phosphoric acid and ammonia were \$228, \$396 and \$174 respectively. According to these prices, the value of domestically produced DAP (ammonia and acid are combined to make DAP) with imported acid and ammonia works out to \$226.62. But price movements since then have made imports of DAP a little cheaper.

If a decision is taken to import DAP it is certain that domestic phosphatic units will be completely choked off. Raw material supplies are running low and already some units, including the Kakinada unit of Godavari Fertilisers, has closed down. Assuming that the funds allotted are used to import phosphoric acid and a corresponding amount of ammonia only, it is estimated that only 1.5 lakh tonnes of acid and 70,000

tonnes of ammonia can be purchased. This is barely a month's raw material supply for the fertiliser units and surely not enough to keep them going for the rest of the year.

In any case, the time lag between contracting supplies abroad and their arrival in India would mean that the plants would remain closed until the end of December. The units that face imminent closure are the Kandla unit of IFFCO, the Goa plant of Zuari Agro, the Madras plant of MFL, the Sikka unit of GSFC, Hindustan Lever's Haldia outfit, Paradeep Phosphate's plant at Paradeep, MCFL's Mangalore plant and the Tutricorin and Alwaye units of SPIC and FACT.

Those who support import of phosphoric acid claim that the unutilised domestic capacity should be taken into account while determining the cost-benefit of importing DAP at the cost of acid. It is claimed that phosphoric acid, being in liquid form, can be handled quickly at the ports. It is also easy to transport by land as compared to DAP.

MANUFACTURE OF CARBOFURAN TECHNICAL: Rs. 347 LAKH RALLIS PLANT AT RATNAGIRI

Rallis is going in for the manufacture of carbofuran technical with a capacity of 400 tpa. A Rs. 347 lakhs plant is being put up in Maharashtra's Ratnagiri district for implementing the project, which was recently cleared by the government.

Earlier, in 1988 the government turned down the same project on the ground that the company had not linked the unit to backward integration starting from the basic stage as stipulated by the government. Moreover, the phosgenation facility was not available with the company at that time. In the revised proposal the company has told the government that it would manufacture car-

bofuran technical from the basic stage and it plans to put up the phosgenation facility with the help of an indigenous manufacturer who had idle capacity.

Both these factors weighed in favour of the project. The project cost will be met through debentures (Rs. 85 lakhs) rupee loans from NRIs (Rs. 115 lakhs) and internal resources (Rs. 147 lakhs). Rallis is a large industrial house with assets worth Rs. 197.88 crores (as on March 1990) spread over eight undertakings. The Ratnagiri project was opposed by the National Chemical Laboratory, Pune, on the ground that a non-phosgene/non-MIC route for the manufacture of carbamate pesticides had been developed by them which can be made use of by Rallis. Rallis, however, argued that the Pune lab's technology was not relevant to the manufacture of carbofuran.

One condition imposed by the government while sanctioning the project is that 50 per cent of the production of the technical material shall be supplied to non-associated formulators. It was also stipulated that prior to commissioning of the Ratnagiri plant the supplier of phosgene shall obtain clearance from the factories inspectorate for restarting their idle plant.

OIL INDIA GROSS PROFIT UP BY 19 PER CENT

Oil India Ltd. (OIL) has registered an increase of about 9% in gross profit for 1989-90. The profit before tax during the year increased to Rs. 122.08 crores from Rs. 102.55 crores in 1988-89. The chairman and managing director of OIL, Mr. C. Ratnam, handed over a dividend cheque of Rs. 4.20 crores to the Union Minister of state for petroleum and chemicals. OIL has declared a dividend of 15 per cent on its paid up capital of Rs. 28 crores. The rise in profits, the company claimed was mainly due to improved production levels registered over the previous year and other pricing adjustments.

GAIL polypropylene unit in 1992

The polypropylene unit to be set up by the Gas Authority of India Ltd. (GAIL) in collaboration with Tecnimont of Italy at Vijaipur, Madhya Pradesh, will go on stream in 1992. This would be the fourth polypropylene unit to be set up in the country in collaboration with Tecnimont. The plant would have a capacity of one lakh tonnes of yarn per annum.

Tecnimont had earlier tied up with the Indian Petrochemicals Corporation Ltd. (IPCL) for four polypropylene units. The other plants are at Baroda, Gujarat and Nagothane, Maharashtra. The plants in Nagothane and Vijaipur are to set up on the Spheripol technology, according to sources in Tecnimont.

Tecnimont has also tied up with DCL Synthetics and Chemicals Ltd. to set up an acrylic fibre unit in Maharashtra. The company has already set up two such plants, one each at Kota and Jhalwar in collaboration with the JK Synthetics. This would also go on stream in 1992 and its capacity would be 12,000 tonnes per annum.

The DCL decision to go into acrylic fibre is, however, questionable as there already is a glut in the market and JK Synthetics which has been in this line for some time now has further increased

its capacity. The only option left for the company would be to either go in for diversification of the product base as planned by the JK Synthetics or enter export markets.

The tie-up for polypropylene is the 42nd Tecnimont collaboration in the country. The company is active in the market since 1963 when it collaborated with the Indian Dyestuff Industries for the manufacture of dyestuff and intermediates in Kalyan, Maharashtra. The company has tie ups with various public and private companies in the country for the manufacture of nitric acid, ammonium nitrate, urea, aluminium and super phosphate other than polypropylene and acrylic fibre.

Tecnimont has also set up projects in other countries, some of which cover environmental protection and effluent treatment, power generation and distribution and agro-industry. In the field of agro-industry, the company has recently commissioned a project in the USSR for the improvement of five lakh hectares of land to spur production of meat, milk, sugar and oil.

In power distribution, projects have been set up in Pakistan, Columbia, Peru, Brazil, Greece and Argentina. As for effluent treatment the company has set

up projects for treatment of gaseous effluents and wastes from industrial plants, as well as for computerised evaluation systems for diffusion of air pollutants from industrial and power plants.

SPIRALLING PRICES OF PLASTICS RAW MATERIALS AFFECTS PACKAGING SSIs

Nearly a third of small scale packaging units have downed their shutters as a result of the spiralling prices of plastic raw materials.

The price rise in the case of finished plastic products is around 35 to 40 per cent. In view of the present situation, the competitive edge of plastic packaging material has declined. Consumers' resistance to plastic finished products arise due to the fact that they have to pay twice the price compared to other packaging materials like aluminium, jute, tinplate, etc. According to industry sources, there is unlikely to be any change in the price situation even if the Gulf crisis is resolved. Also, indigenous supply from IPCL and PIL is unlikely in the near future. With the Nagothane tragedy engulfing IPCL, the situation for the packaging industry is going to be worst. The present level of consumption of plastics in India is around 0.8 million tonnes of which the packaging takes up around 0.2 million tonnes.

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DISHONOURING CONTRACTUAL COMMITMENTS

Jai Fibres claims damages from Hyundai Corporation

Jai Fibres Ltd., a Rs. 20-crore turnover unit, has served a legal notice on Hyundai Corporation, the Korean conglomerate, claiming damages for dishonouring contractual commitments. The Indian company had contracted for purchase of 160 tonnes of high density polyethylene through Everest International, Hyundai's agent, at \$975 per tonne C & F Bombay, as per terms and conditions in an indent dated August 29.

Pursuant to the indent, Jai Fibres opened an irrevocable letter of credit for \$1,56,000 for the material. "The said letter of credit specifically provided that shipment was to be made by 31.10.90. There was thus a concluded and binding contract under which you were to supply the said goods to our clients at the aforesaid price", says the legal notice from Desai, Berjis & Chinoy,

solicitors and advocates. Mr. I.K. Han, general manager of Hyundai Bombay office, telexed the company that Hyundai was unable to supply the material at the agreed price because Chinese authorities had unilaterally raised the price of the material. Hyundai, the telex said, would supply the goods if the client agreed to a higher price of \$1220 a tonne.

Explaining the matter, Mr. Han in an interview told *The Economic Times* that it was a "forced measure", and that Hyundai was in fact sharing the loss with Indian parties. Jai Fibres was not agreeable to the higher price. It told Hyundai that based on its contract with Hyundai, it had contracted to supply processed goods to large industrial houses and public sector undertakings and had given earnest money deposits

and performance guarantees.

The notice says, the very fact that you are willing to supply the said goods at \$1220 per tonne clearly shows that the said goods are available for supply, but you do not want to honour your contract. It needs hardly to be emphasised that just as you would not have reduced the price if the price of the said goods had been reduced, any increase in the price of the said goods has to be borne by you..."

Jai Fibres has claimed \$39,200 being the difference in the contracted price and the price of \$1220 a tonne prevailing on 31 October, when the LC expired. In addition, it has sought Rs. 6,45,663.20 being import duty at 91 per cent on \$39,200 failing which, legal proceedings will be initiated.

Most other units, desperately in need of material, have agreed to the higher price and amended the letters of credit accordingly. Some other well-known Korean companies have also refused to ship material unless the Indian clients agreed to revise prices, according to industry sources. The additional foreign exchange outgo on this count will run into hundreds of crores, sources said.

A Dutch company has stood by its commitment on PVC of Chinese origin though it had to suffer losses due to upward revision of prices by China, sources said. Yugoslavia, also doing polymer business with India for years, has stood by its commitments.

"Only the Koreans are trying to blackmail us", trade sources said. Koreans are speculating at the cost of Indian customers, many feel. "If the price falls, they gain and if the price rises, they pass it on to the Indians. It is so one-sided in practice."

Koreans dare not do this in any developed country, one affected party said. He wanted the Commerce Ministry and Reserve Bank of India to put a team on the job to find out what is the additional foreign exchange outgo in such cases. He said in any other country, Hyundai's licence would have been cancelled and the firm blacklisted.

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ACCELERATING GROWTH IN NORTH EAST

Major IOC projects planned

The Assam Oil Division (AOD) of the Indian Oil Corporation (IOC) has decided to implement several major projects in the North East with a view to accelerating economic activities in the region. While implementation work of the Rs. 144 crore Digboi refinery modernisation project had already started, which was scheduled for completion by 1993-94, three other major projects have been approved and are under implementation.

The projects include a Rs. 34-crore catalytic reforming unit, a Rs. 17-crore hydro finishing unit and a Rs. 14-crore developmental project for producing bitumen from wax crude, according to AOD general manager, Mr. R.K. Dutta. In order to convert the 90-year old Digboi refinery to a speciality-product refinery, several projects were planned to enhance production of high-value speciality products such as microcrystalline waxes, bitumen from waxy crude, naphthenic oil and needle coke.

While the Rs. 7 crore effluent treatment plant, to meet the requirement of effluent quality, was already implemented, LPG recovery would be possible from the Digboi refinery if the proposal for a new cracker unit was approved, Mr. Dutta said. On the marketing front, he said, AOD had enhanced depot storage tankage capacity from 4000 KL in 1981-82 to about 41,000 KL. Also modernisation of the Tinsukia terminal, the oldest in the country, at a cost of about Rs. 10 crores was underway to ease the present crisis.

To overcome congestion at Guwahati refinery for tank and truck loading, Mr. Dutta said, AOD had commenced construction of a Rs. 7 crore tap-off point in Guwahati, to be completed within the next two years. To augment storage facilities, construction of a new AOD depot at Barapani, in Meghalaya, at an estimated investment of Rs. 277 lakhs

was undertaken for completion this year.

With the completion of these and several other projects, including augmentation of tankage at the Khotkhoti depot and a new rail head depot at Bhairavi in Mizoram, distribution of products in the North East would be further strengthened, the general manager pointed out. In consultation with the governments of the North East, 130 locations were identified in Assam, Arunachal Pradesh, Manipur, Tripura and Nagaland for providing LPG coverage to reduce firewood usage and forest preservation.

Mr. Dutta said, the Rs. 7 crore LPG bottling plant, near Silchar, now under construction, could be operated by 1991-92, and the proposal for increasing the capacity of the Guwahati bott-

ling plant was expected shortly. The general manager disclosed that the present LPG production in the North East at 62,000 MTPA would be soon enhanced by 13,000 MTPA on completion of LPG recovery from coker gas by Guwahati refinery while further 31,000 MTPA would be produced by the Bongaigaon Refinery and Petrochemical Limited in the next two years.

The Silchar bottling plant, Mr. Dutta said, would meet the 5,000 MTPA shortfall in supply of LPG, and provision was made to double its capacity after commissioning. In order to avoid shortage in bottling capacity, resisting of the Guwahati bottling plant, with an enhanced capacity of 25,000 MTPA and with an in-built provision for increasing it to 40,000 MTPA, was planned, he said. For achieving self sufficiency in production and bottling of LPG from 1991-92 onwards, manufacturing of cylinders within the region and other steps were being undertaken.

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ONGC scheme to raise Bombay offshore output

The Oil and Natural Gas Commission (ONGC) has decided to raise annual production from Bombay offshore from the current level of 22 million tonnes to 30 million tonnes by the end of Eighth Plan through an ambitious scheme estimated to cost over Rs. 10,000 crores.

Going by the current international crude prices quoted around \$34 per barrel, the value of the increased annual production of eight million tonnes comes to \$2040 million.

According to official sources, a number of projects have been planned for developing the discovered fields in Bombay offshore by creating suitable surface facilities for transportation and processing of oil and gas. These projects include the development of Neelam, Mukta, Panna, L-II, L-III-infill and the gas flaring reduction project.

Out of the 200 prospects likely to be taken up for exploration in the west coast in the Eighth Plan, 165 belong to Bombay offshore area alone. Within the Bombay offshore basin, according to official sources, the Heera-Panna-Bassein block and Daman offshore will receive greater emphasis followed by Bombay High and Ratnagiri shelf. The other thrust areas of exploration include stratigraphic traps on the periphery of Bombay High platform, basement rocks and deeper water basins.

Besides increasing the production level, these schemes would help in increasing the utilisation of gas by over 11 million cubic metres per day from Bombay High. The total cost envisaged for the implementation of these projects would be about Rs. 10,650 crores. While the Government has already approved the projects for the develop-

ment of Neelam, Mukta, Panna, the schemes for the development of L-II in Bombay High, enhanced oil recovery project in Bombay High South and the gas flaring reduction project are being posed to the World Bank.

The cumulative oil production during the next plan period from the west coast is estimated to be about 129 million tonnes, up from the Seventh Plan's total oil production of 104.33 million tonnes from the region. The Eighth Plan terminal year production of oil is estimated to increase to about 30 million tonnes from the present level of 22 million tonnes.

The Neelam field comprising B-131 and B-132 structures is located about 45 km south-west of Bombay. The field is considered to be highly prospective and is expected to contribute about four million tonnes per annum to the total production. This would be achieved through drilling of 100 oil wells to be connected to 12 well platforms and then to a process complex.

The process complex would have provision for starting water injection right from beginning to maximise the recovery from the fields. The scheme for the development of Neelam has already been cleared by the Government at an estimated cost of Rs. 2,661.9 crores. The Public Investment Board (PIB) has already granted approval of Rs. 1,395.05 crores for the development of Mukta field in the western offshore. The Mukta field is in fact a cluster of two structures — B-57 and B-19.

The facilities envisaged for development of the field include erection of six well platforms, completion of 50 wells including completion of three sub-sea wells, a process complex consisting of oil and gas processing platforms with gas lift and water injection platforms and fluid flow lines. The peak oil production from the field is expected to be close to two million tonnes per annum and 1.4 million cubic metres associated gas per day.

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The Panna field has an estimated geological resource potential of 85 million tonnes. The peak oil production after the field has been completely developed is estimated to be about 1.59 million tonnes per annum. The Government has already cleared the development of the field at an investment of about Rs. 1,149 crores. The facilities being proposed to be created include installation of eight well platforms, 69 development wells, oil and gas processing platform complex and flow lines from various well platforms to the process platforms.

Dual completion of wells and appropriate well completion techniques are being planned alongwith additional surface facilities as free gas and oil are simultaneously being considered for production from the field. Detailed schemes have also been prepared for enhancing the production from the Bombay High fields. The three schemes proposed by ONGC for enhancing the production and utilisation of gas from Bombay High are development of L-II, enhanced oil recovery project in Bombay High South (L-III-infill) and the gas flaring reduction project.

If implemented as proposed, they would result in enhancing production to the extent of 66.545 million tonnes of oil and gas by 26 billion cubic metres up to the year 2010. Not only this, the entire scheme would help in increasing the utilisation of gas by about 11 million cubic metres per day from Bombay. In monetary terms, the direct saving of resources would be to the extent of Rs. 2.77 crores per day.

The L-II reservoir is mainly present in the northern part of Bombay High structure. The development of L-II envisages the construction of five well platforms, drilling and completion of 42 wells, process platform, interconnecting sub-marine pipelines and gas feeder line. The reservoir stimulation studies for this reservoir have estimated

lion tonnes of oil and about eight billion cubic metres of gas. In addition to this, the implementation of this project will help increase the utilisation of 2.69 billion cubic metres of gas over the entire life of the project. The estimated cost of the scheme is about Rs. 11,000 crores.

NO CUT IN CRUDE OIL ALLOCATION TO GUJARAT FARMS

The Centre has assured that no cut would be imposed upon the crude oil allocation for the agricultural sector in view of Gujarat's dire needs.

According to the official sources at Gandhinagar, the Union Petroleum Secretary accepted the representation made in this connection by the state chief secretary Mr. H.K. Khan, at New Delhi. The sources said Mr. Khan apprised the Petroleum Secretary of the planning for the ensuing rabi crops and requested him to review the proposed cut, imposed

by the Union Government in the crude oil allocation, in case of Gujarat.

DESALINATION PLANT AT BARC

For the first time in the country a desalination prototype facility — multi-stage flash (MSF) unit with 425 cubic metre per day fresh water capacity has been designed, fabricated, installed and commissioned at the Bhabha Atomic Research Centre (BARC), Bombay. The MSF has been designed to convert sea water into fresh water with overall purity of 30 ppm (parts per million) total dissolved solids (tds), according to Dr. M.P.S. Ramani, head, desalination division of BARC.

Although the permissible quantity of tds in the drinking water, according to WHO, should be 500 ppm, for developing countries it has allowed upto 1,000 ppm owing to technological hindrances.

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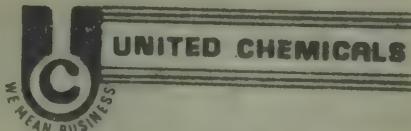
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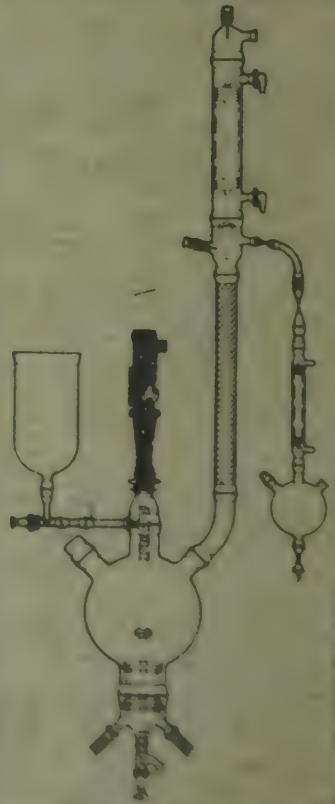
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TISCO's New energy-saving furnace

The country's first energy optimising furnace (EOF), designed to save energy and produce low-cost quality steel, was inaugurated at the Tata Iron and Steel Company (TISCO) Jamshedpur on Nov. 14. EOF, installed at a cost of Rs. 53.4 crores, would require no electrical energy for melting and would produce 1,600 tonnes of steel per day. The annual target has been fixed at 50 lakh tonnes.

Developed by Korf, K.G. of Germany and installed by the Tata-Korf Engineering Services in a period of 16 months, EOF handles solid, liquid and mixed charges with equal efficiency. Speaking on the occasion, the TISCO Chairman, Mr. Russi Modi, said that EOF was the answer to energy shortage that plague the Indian steel industry. The installation would help save Rs. 12 crores of petrol fuel every year.

All the five electric furnaces of the plant would be replaced by the Korf EOF. Mr. Modi said that EOF in future would replace all the old open hearth process, LD and electric furnaces as it required low-capital investment with complete flexibility in feed stock like scrap input, hot metal and could use up to 100 per cent scrap.

About 400 steel units, including Steel

Authority of India Ltd. had also shown interest in the Tata-Korf technology. SAIL's Bhilai, Bokaro, Burnpur and Durgapur units is likely to opt for the system.

ENERGY-SAVING FRIDGE POSSIBLE, SAYS PHDCCI

The power consumption in the normal 165 litre refrigerators could easily be reduced by 60 per cent by proper re-designing, according to a report prepared by the energy audit cell of the PHD Chamber of Commerce and Industry (PHDCCI).

The report on "Energy saving in refrigeration and airconditioning systems" revealed that with the addition of around Rs. 1,200 per refrigerator, each of these machines could save around Rs. 300 a year in power billing. It would also help in bringing down the load on the generation system and reduce the coal haulage by almost 200 kilograms per year.

Since there are millions of these machines working in the country, at present, the savings in terms of power generation cost would be tremendous. Every one million refrigerators would save around 1.5 lakh tonnes of coal per annum, the report added. The refrigera-

tors should be made either cubical or spherical, a shape that would help the machines in reducing the power consumption, the report added. The industry has suggested drawing up of codes for both airconditioning and refrigeration equipment so as to make them efficient in energy, which is not beyond the capacity of the manufacturers, the report said.

CALL TO CONSERVE ENERGY

The Gujarat Energy Development Agency (GEDA), the States model agency for the promotion and polarisation of renewable sources of energy, has stressed the need for conservation of energy, as the Gulf crisis had plunged the world, especially India, into a deep energy and economic abyss.

As part of the energy conservation week being observed throughout the country from November 9, GEDA in a release said every unit of electricity conserved is preserved for future use and is equal to a third unit generated. The industrial sector can achieve a great deal in energy conservation, as one unit of energy used in Indian industry produces only half of what is produced in developed countries, the release said. It also suggested adoption of fuel-efficient measures in the transport and agricultural sector.

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Tamper-proof N-reactor developed

A new generation of nuclear reactors immune to sabotage, insensitive to human error and with "process inherent ultimate safety" (PIUS) is being launched by Sweden. PIUS is a modified pressurised water reactor-based directly on operating experience from light-water reactors and international marketing of the new concept is now under way, according to Swedish International Press report.

The new nuclear reactor is expected to have a lifetime of 60 years or more. The technology has been based on safety and on simple, easily understood principles and is to a large degree insensitive to human error, the manufacturers say. The 2,000 MW thermal power unit is estimated to require a construction time of three years from first concreting to fuel loading, with the possibility of a further reduction when prefabricated parts and modular techniques are employed.

The 44-M high prestressed concrete pressure vessel has a base area of 27 by 27-M and weighs 63,000 tonnes. It accommodates a cavity 38-M high and 12-M in diameter. The wall thickness of seven to 10-M is said to be sufficient to resist all conceivable external incidents without rupturing. One special feature is that the reactor will have natural

circulation cooling which connects the core to a large pool of borated water.

The water temperature is constantly kept at below 95°C in all operating modes, even in the event of total station blackout. The reactor is also provided with a containment which prevents the release of fission products from leaking fuel rods, should, for example, a primary system pipe rupture occur.

PIUS is said to have cost advantages over boiling water reactor plants in incorporating all the latest cost-reducing features. Fuel cycle costs are slightly higher than for conventional power stations due to the lower primary coolant temperature and the corresponding drop in thermal efficiency in the turbine cycle, but the personnel and plant maintenance costs should be lower as lesser security personnel are needed as the reactor is tamper-proof.

HYGIENISATION PLANT AT BARODA SOON

Bhabha Atomic Research Centre (BARC) Director, Dr. R. Chidambaram has said the sewage hygienisation research irradiator would be shortly commissioned at Baroda. Speaking at the founder's day at Bombay recently on the birthday of Dr. Homi Bhabha,

Dr. Chidambaram said this plant, the first of its kind in the country, would be able to handle about half the sewage of Baroda city.

The radioisotope technique was also used for checking Bombay-Pune petroleum pipeline for blockage, he added. In the field of biology and agriculture, he said about 500 metric tonnes of certified seeds of crop varieties developed at BARC were produced by Maharashtra and Andhra Pradesh State Seed Corporations for distribution to farmers. Dr. Chidambaram said two new mutants of groundnut and blackgram were recommended for release in Gujarat, Maharashtra and Madhya Pradesh. A new mungbeam variety resistant to powdery mildew disease was pre-released for cultivation in Maharashtra. The techno-economic feasibility of irradiation preservation of onions was demonstrated by conducting large-scale storage studies in Maharashtra and Gujarat, he said adding that a net saving of about 20 per cent of onions was obtained at these locations under the prevailing storage conditions. In the ongoing research on radiation sterilisation and radiation preservation of food, new facilities in pulse radiolysis technique were set up to understand the primary mechanistic steps at the early stages of radiation effects on various biologically important systems.

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Effluents flow into Damodar alarming

The river Damodar — lifeline to millions in Bihar and West Bengal — threatens to turn into a "river of agony", thanks to increasingly unchecked flow of industrial effluents from industries including coal mines, coal washeries, thermal power, steel, fertiliser and cement plants.

At present, more than 352,000 hectares of crop area receive assured irrigation from the Damodar Valley Corporation (DVC), while over 125 private and public sector industrial units in the Damodar Valley get their full requirement of water round the year. Municipal water supply for all the important towns and cities in the valley as well as domestic needs of rural and semi-urban population centre in coal-field areas is being met by DVC.

According to the scientists of the Central Mining Research Station, Dhanbad, the river receives huge quantity of fly-ash from Patratu, Bokaro and Chandrapura thermal power stations besides coal fines, shales and dirts from coal washeries. The detrimental effects of soil erosion are ultimately felt in silting and degradation of streams, they say.

The Damodar river is "highly polluted" due to release of chemical wastes, including ammonia, phenol, cyanides, oil and grease, from Indian Explosives Ltd., Bokaro Steel plant, the Fertiliser Corporation of India plant at Sindri, and a number of coke oven plants in Jharia Coalfield, the scientists say. On April 5 this year, about 400 kilolitres of furnace oil leaked from the Bokaro steel plant causing "large-scale damage" to the quality of water of the Damodar, they point out.

In the absence of reliable alternative sources of water, most of the towns in the Damodar Valey depend solely on this river for domestic, agricultural and industrial use. Mr. P. Mishra, chairman of the Bihar State Pollution Control

Board, says the effluent treatment facilities at the FCI plant at Sindri "are inadequate and the final effluent has high content of T.S.S. and ammoniacal nitrogen".

The Director of Central Inland Capture Fisheries Research Institute, Barrackpore; Mr. Arun G. Jhingran, says the "quantum of toxicants like heavy metals, fly ash, oil and grease, ammonia, phenol and cyanide, being much above the lethal concentration, have generated a negative impact on the natural habitats of the entire ecosystem". The lower valley of the Damodar, below the Durgapur barrage, "where the entire effluxion from the Durgapur industrial complex mingles with the river, is most severely affected. The polluted water used for irrigation is continuously transmitting the heavy metal and other persistent toxicants into the human system through agricultural and aquatic products", Mr. Jhingran says.

Mr. Mishra says a study of the contamination of Damodar water following the leak of furnace oil from the Bokaro steel plant reveals that "even during normal times the level of oil and grease in stretches of the river is far beyond the permissible limit". A rough computation, he said, would indicate that about 25 million tonnes of coal is washed annually from 15 coal washeries which discharge their effluents into the Damodar.

An analysis of the samples collected from 13 coal washeries bring out an "alarming picture". Mr. Mishra says and adds "the total suspended solid of none of the effluent is within the permissible limit. In fact, in most cases, the quantity of suspended solid is more than 40 to 50 times of the permissible level". "Similarly, the level of oil and grease is within the permissible limit in only one case", he points out.

Mr. Mishra says the flow of solid waste into the river is "causing silting

of various dams and flood control measures at an accelerated rate and is considerably reducing the rate of life span of the dams and hydro-electric installations". Dr. Nilay Chaudhury, former chairman of the Central Pollution Control Board, says input of chemical fertilisers and pest control chemicals in agriculture causes water pollution as excess irrigation water and rainfall flushes these chemicals into the water bodies.

The algal boom caused by fertilising chemicals like nitrogen and phosphorous depletes oxygen in water and causes death to fish and other air-breathing aquatic life. The pest control chemicals "get bioaccumulated in different aquatic life and causes excessive accumulation of the pest chemicals in fish. Consumption of such fish by men causes more accumulation of these chemicals in man's fatty tissues. At certain accumulated dose, these chemicals may cause cancer in men", Dr. Chaudhury warns.

The Damodar, once known as the river of sorrow for frequent floods, has now become "a cause for agony" in terms of pollution due to continued and uncontrolled discharge of toxic and oxygen-consuming waste waters into the river, he said.

NITROGEN LOSS FROM LEAVES OF CROP PLANTS

Nitrogen is an important constituent of plants. It is known that the aerial parts of crop plants like mung, wheat and sorghum lose nitrogen, but the magnitude of this loss vis-a-vis the overall balance sheet needs investigation, according to S.R. Chatterjee and Y.P. Abrol of the Indian Agricultural Research Institute, New Delhi. Nitrogen can be lost by leaching out from the roots, by the discharge of pollen, the shedding of leaves and in the forms of compounds of varying stability and is, therefore, protected in solution or in solid forms. At higher pH values, it is more likely to become volatile.

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NPC workshop on pollution control

The National Productivity Council (NPC) organised an 'international workshop on pollution prevention and low waste technology' at New Delhi on November 18. The five-day workshop, sponsored by Carl Duisberg Gesellschaft (CDG) of Germany, was inaugurated by the secretary, Environment and Forests, Mr. Mahesh Prasad. The workshop was being organised with the main objective of exposing the problems related to application of low waste technologies and also to evolve strategies for propagation of pollution prevention techniques.

The programme covered the various developments in this field and in checking out countrywise application packages. The subject and issues related to the control of environmental pollution are a matter of intense debate both in developed and developing countries today. As this problem exists in most parts of the world, the responses of dif-

ferent countries have conventionally been curative comprising mostly of damage-repair oriented strategies. However, it is being realised more and more that the curative measures only 'move' the wastes and pollutants around and do not eventually offer permanent solutions to the environmental problems. This has resulted in a shift of focus to clean-up techniques and low waste manufacturing technologies which either help in cutting down the generation of pollutants right at the source or cut out the entire pollution load.

In this context and also with the fact that most developing countries do not possess the necessary wherewithals or the know-how in this field, the workshop would present a forum for propagating the concept, techniques, technologies and also dissemination of information in this subject. Members from several countries participated in the workshop. The Indian section

included about 20 main speakers who included Mr. Mukul Sanwal, Joint Secretary in the Ministry of Environment and Forests, Director of the National Environmental Engineering Research Institute, Prof. P. Khanna, Dr. T.N. Khusoo, of the Tata Energy Research Institute and Dr. Ashok Khosla, Director, Development Alternatives.

DYES AND DYESTUFFS INDUSTRY: UNIDO SCHEME FOR POLLUTION CONTROL

The Ministry of Chemicals and Petrochemicals has approached UNIDO for developing a model to check pollution in the dyestuffs industry. The manufacturers however, need not wait for UNIDO recommendations to adopt pollution control measures, Mr. M.S. Gill, secretary, Ministry of Chemicals and Petrochemicals said at Bombay on November 16. Dyes and dyestuff firms need to devise production methods which will lower energy consumption. The Ministry is also concerned over the energy-intensive nature of the industry, Mr. Gill informed.

The industry's performance has been adversely affected due to its heavy dependence on the textile industry. Indian manufacturers need to concentrate on non-textile users in order to boost production levels according to Mr. Gill. Production figures declined by 9 per cent during the period 1980-84 as a result of the crisis in the textile industry, Mr. Gill pointed out. Manufacturers need to concentrate on paints and printing ink industry as global trends indicate consumption of dyes and dyestuffs has grown more rapidly among these firms, Mr. Gill claimed. According to a recent study by the ministry, demand for dyes and dyestuffs in India is expected to grow at a compound rate of 4% over the next decade. For '89-90, demand has been estimated at 40,065 tonnes and is expected to increase to 61,000 tonnes by 1994-95. Indian manufacturers need to upgrade technology and production processes.

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India eligible for IMF aid under CCFF

India is now eligible to get assistance from the International Monetary Fund (IMF) under its Contingency Compensatory Financing Facility (CCFF). The IMF board met in Washington on Nov. 16 and decided to extend CCFF assistance to countries hit by the oil crisis. The quantum of assistance India may get from IMF under the modified CCFF will depend on the forecast trend of international oil price in the next 24 months. According to present IMF estimates, the oil price may stabilise at \$32/barrel in the next 24 months. On that basis, India may be eligible for a CCFF assistance of around \$400-450 million.

But the assistance quantum may be higher if the oil prices according to the IMF forecast shows to be ruling at higher levels than \$32 per barrel. The CCFF assistance will be available to India at the normal rate of interest of nine per cent per annum. Only two conditions will be imposed on the country receiving such assistance. One, the recipient country should not allow the hike in oil prices affect its fiscal system and take appropriate remedial measures. Two, the country should follow a pragmatic energy policy by which the impact of the oil crisis on its economy can be kept under check.

However, the fact is India has not yet made any formal application for getting assistance from the IMF under CCFF. Before doing that, the new government has to take a decision on this issue. The National Front government had only pleaded for a change in the terms of providing assistance under CCFF, so that India could become eligible and claim loans under the facility. But even if the new government agrees to apply for assistance under CCFF, the quantum of aid would be well under \$1 billion, which was expected by the previous government. This may force India to look for fresh avenues of assistance either under any new facility of the IMF or from other sources. Even on this the new government has to take a decision.

The two officials of the Finance Ministry, who had gone to Washington to discuss with the IMF, details regarding CCFF, were told of the other options India has for getting assistance from the fund under other facilities like the stand-by credit arrangement or the structural adjustment facility.

The National Front government had expected \$1 billion assistance under CCFF on the understanding that both its proposals would be accepted by the IMF board. These were: extend CCFF assistance to countries hit by an oil crisis (till then only certain commodities were included) and exclude the trend growth in exports of the applicant country, while determining assistance entitlement.

The IMF board has accepted the first proposal, but has rejected the second one. If the second one were also accepted by the IMF board, then India would have got at least \$1 billion under CCFF. The former Finance Minister, Prof. Madhu Dandavate, during his visit to Washington in September had pleaded with the IMF management for modifying the norms for providing assistance under CCFF in such a manner that it can get some benefit from this facility.

Prof. Dandavate was assured by the IMF management that it would consider India's request favourably and its approach to the question of modifying CCFF norms would be flexible. The IMF board's decision to extend CCFF to countries hit by oil crisis is likely to help around 40 more developing countries including Bangladesh, Pakistan and Sri Lanka.

India's balance of payments is under severe strain following the Gulf crisis. The total additional burden on India's BoP has been of the order of \$2.8 billion. The decision of the International Monetary Fund to extend expeditious financial assistance to some 40 coun-

tries, including India, hit by the Gulf crisis has brought some relief to the new government.

Among the issues to which Prime Minister Mr. Chandrashekhar would have to address himself immediately is the country's precarious balance of payments position. Besides deciding on making a formal application for assistance under the CCFF, the government would also have to examine whether additional assistance would be necessary and how to go about securing it.

According to informed sources, Egypt, Jordan and Turkey, which have come to be known as the frontline states, would be the first to benefit by the CCFF. India, Pakistan, Bangladesh, Sri Lanka, Philippines, Morocco and Sudan are among the other countries listed for assistance. Meanwhile, some countries including the U.S., the European Community and Saudi Arabia have contributed \$13 billion to the Fund set up at the request of President Bush to assist the affected nations.

DECISION ON FOREIGN STAKE DILUTION IN ROCHE SOON

The proposal for dilution of Roche Holdings' (formerly F. Hoffmann La Roche and Co) stake in Roche Product is expected to be finalised shortly. The managing director of Roche Products, Mr. J.J. Vorsanger, will visit Basle shortly for negotiations with Roche Holdings' top brass.

According to a top company source, various options for Roche Holdings' disinvestment in the company have already been discussed in-depth. However, a final decision on the quantum as well as mode of dilution will be taken only after Mr. Vorsanger's discussions with his counterpart in Basle. Roche Holdings currently has a 74 per cent stake in Roche Products. Voltas has a stake of 9.5 per cent and financial institutions 3.5 per cent. The rest is held by the public.



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Projects okayed after Oct. 23 to be reviewed

The Union Government will review all the important decisions and the major projects cleared after October 23 by the V.P. Singh's National Front Government. Instructions in this regard were issued to all the secretaries of the Ministries concerned by the Cabinet Secretary, Mr. Vinod Pande, a few days ago. The review decision follows the discussions the new Prime Minister, Mr. Chandra Shekhar, had with top-level bureaucrats last week. Apart from the clearances to certain major project proposals to be brought under the microscope, the exercise is to include even the selection of chiefs for a large number of public sector undertakings (PSUs) many of which have been topless for years together.

The Ministries had recently sent in their recommendations to the Appointments Committee of the Cabinet and decisions were taken on some of them. According to official sources, the rec-

ommendations are being sent back to the Ministries to enable the ministries' incumbents to look into them. "The concerned files are popping back to us every day and the whole process of selection will start all over again", said one official.

The cut-off date, October 23, is significant as that was when the Bharatiya Janata Party (BJP) withdrew its support to the NF Govt. leaving it a minority. Technically, from then on, the V.P. Singh govt. had no locus stand to take any important decision or approve any major project. In fact, the President Mr. R. Venkataraman, had also warned the Govt. that no significant decisions should be taken till Nov. 7, the day the Prime Minister was to seek a vote of confidence in the Lok Sabha. However, throwing caution to the winds, the Ministers went on a project clearance spree and activity was in full swing almost till the day the govt. bowed out

of office. During the period, a meeting of the Cabinet Committee on Economic Affairs (CCEA) was also held and pending projects were cleared with undue haste. These decisions are now likely to be held null and void. Some of the projects hastily approved are the petrochemical project to be set up as an export-oriented unit (EOU) in Madras by the R.P. Goenka group in collaboration with Linde AG of Germany, the Indo-Asahi float glass project in collaboration with Asahi of Japan, the development of Panna and Mukta oilfields by the State-owned Oil and Natural Gas Commission (ONGC).

At the Industry Ministry level, clearances were given to a host of new sugar units and letters of intent have also been issued. The other controversial project approved by Mr. Ajit Singh was the Thapar-Du Pont proposal for the manufacture of nylon-66 based on the recommendations of the Special Projects Approval Board (PAB) and the stipulation of foreign exchange neutrality. Although the proposal, in any case, was to be referred to CCEA, it is now to be reviewed again at the Ministry level. However, it is not known whether the petrochemical EOU and the float glass project have already been issued letters of intent. In that event, the review will be a ticklish issue and may even lead to a legal tangle. Sources point out that in normal circumstances LIs are not issued so fast and if they have been, it only shows undue haste. In any case, the Government has ways to stall projects if it does not want them. The public sector oilfield projects have nothing much to bother about except further delay. These projects have already been delayed for long and for which the country is paying the price by way of higher imports of crude. Incidentally, while the promoter of the Madras project had flown down to Delhi on October 23 itself to enquire about the fate of his project and which was subsequently cleared by CCEA in an unprecedented move, others whose projects have been hanging fire have been quiet.

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Agro-based biotech plant in Tamil Nadu

A Rs. 21.53 crore hi-tech agro-based biotechnology plant is being set up in South Arcot district of Tamil Nadu. The new joint sector project named Ushta-Te Biotech Industries, will see the coming together of the Tamil Nadu Industrial Development Corporation (TIDCO) and K.N. Dandina Pvt. Ltd. Technical expertise will be provided by Starcosa GmbH of Germany, world leaders in enzyme technology.

The private sector participant in the project, K.N. Dandina Ltd. is a well-established soil and foundation engineering firm having executed a number of projects both within the country and abroad during its 26-year existence. Claimed to be the only one of its kind in the country, Ushta-Te will make high fructose syrup and other value added starch derivatives from tapioca, for the first time on a commercial scale. Hence the plant's location in South Arcot district, traditionally rich in tapioca.

It will manufacture 6600 tpa of high fructose syrup, 6270 tpa of glucose syrup, 3300 tpa of dextrose monohydrate, 1155 tpa of dextrose anhydrous, 7400 tpa of starch powder and 22440 tpa of animal feed. These products will find a ready market as they are used in wide array of industries ranging from pharmaceuticals, soft drinks, food processing and canning to cosmetics. With commercial production slated to commence by July next, the company is entering the capital market with a public issue of 28,40,000 equity shares of Rs. 10 each for cash at par.

PHDCCI AGAINST DGS & D RECAST

The PHD Chamber of Commerce and Industry (PHDCCI) has expressed its opinion against the Government's move to decentralise the Directorate General of Supplies and Disposals (DGS & D). In a communication

addressed to the Government, PHDCCI has argued that as a result of the decentralisation of the DGS & D the small-scale industries would be worst affected as they lack the necessary infrastructure and marketing strength to make supplies to individual government purchasers scattered all over the country. The chamber has stated that DGS & D has been playing an important and responsible role as the single largest bulk purchaser of industrial goods both from the private as well as the public sector. It was also pointed out that apart from the procurement of quality goods at economical prices, the Directorate also used to give encouragement to the development of indigenous sources of supply leading to progressive relief from dependence on imports. PHDCCI expressed its opinion while commenting upon the Government's proposal to restrict DGS & D for concluding the rate/running contracts and transferring the procurement against ad hoc indents to indenting ministries/departments.

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Sponge iron units seek export incentives

Sponge iron producers have reportedly approached the government for help to promote exports of sponge iron and have also pleaded for cash assistance. While the local price of sponge iron is over Rs. 4000 per tonne, in the international market, producers are lucky if they get \$130 fob or around Rs. 2,300. This may not cover their cost of production.

To the gas-based sponge iron producers, the major cost is the price of gas which is higher than in competing countries like Venezuela or Malaysia. So if their price disadvantage is neutralised by introducing a scheme under which gas is made available to them at international prices, exports could become viable.

But the sponge iron industry is not yet fully established in the country and it will take some time for it to stabilise. Exports would help the industry to

achieve international standards of excellence. Meanwhile, the world DRI, or sponge iron industry is still in a depressed state. The installed capacity is 25 million tonnes but only 16 million tonnes were produced in 1989, a capacity utilisation of just 63 per cent.

It is forecast that steel capacity in the Asia region would increase by about 8 million tonnes per year in the nineties while the DRI capacity will increase only by 4 million tonnes per year. With shortage of scrap likely to develop there would be better demand for substitute scrap. Further, the success of the thin slab casting technology by Nucor in the US would also increase the demand for sponge iron or DRI.

This slab casting technology is said to offer a \$50 to \$70 per tonne cost advantage over other hot strip products and most of the new mills are likely to take to this technology which requires

more DRI as raw material. This new technology in steel making would increase the demand for DRI and this trend is likely to spread to Western Europe, where at present scrap is fancied over DRI. But even with all the changes, DRI is not likely to meet more than 5 per cent of the solid metallic feed needs of world steel industry by the year 2000.

CRYOFUSION'S GAS PLANTS IN THE OFFING

Cryofusion Products Ltd. is setting up a project to manufacture industrial gas plants and cryogenic equipment. A significant part of production is intended for exports.

Director Sanjiv Agarwal said the foreign collaborator L & A Boschi of Italy was associated with the development of medium and low pressure technology in Europe for long.

Cryofusion Products would start trial production shortly, and commercialise the operation a month later.

The total cost of the project is Rs. 32 crores, which is partly being financed by the Rajasthan Industrial Investment Corporation and Industrial Development Bank of India.

Mr. Agarwal said the company had started making cryogenic liquid tanks with a capacity upto 100,000 litres, and mobile transportation tanks upto 30,000 litres.

The plant is to be located at Bhiwandi in Rajasthan. The company expects a turnover of Rs. 25 crores, and exports worth Rs. 18 crores.

Moreover, the foreign collaborator has agreed to buy back a portion of components and equipments.

Bosch has also agreed to buy plants for supply to West Asia and Asian markets, Mr. Agarwal said.

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Fillip to gasifying underground coal

India's efforts to demonstrate feasibility of gasifying underground coal reserves for production of energy are all set to take concrete shape with the researchers deciding to instal a pilot plant. Underground coal gasification (UCG) is a process of converting coal into coal gases "in situ" or without mining the coal. Gases thus produced can be utilised as fuel gas for power generation or as feedstock for liquid fuels and chemicals.

The Indian research efforts in the area, which began about six years ago, have now reached a turning point with the decision for installation of a pilot plant. The country's first UCG pilot plant is expected to be ready by 1992 at Mehsana coalfields in north Gujarat. Underground coal gasification was identified as a thrust area with the Oil and Natural Gas Commission as the nodal agency and other national labs as members of the steering committee.

The UCG is considered a high-risk advanced technology area and the Indian project is going to be watched keenly by the scientific community worldwide because it is the first time gasification of coal is being attempted at such deep sites. UCG plants have been in operation elsewhere in the world at depths up to a maximum of 500 mt, but the Indian plant aims at gasification at about 1,000 mt to 1,100 mt depth.

"The technology for gasification of coal at shallow depths and that for sites as deep as 1,000 mt and more is entirely different. In this sense, India is going to be a technology leader in UCG for unminable coal reserves", says Dr. K.L. Goel, a scientist at ONGC. The ONGC, while drilling for hydrocarbons, had discovered large reserves of coal to the order of 63 billion tonnes, at depths ranging from 700 mt to 1,700 mt in north Gujarat.

But exploitation of these reserves is not possible through any known

method, due to prevailing sub-surface conditions such as depths, geology, geohydrology, in situ temperatures and high gas content in coal seams. UCG is the only way these reserves could be utilised. The quantum of energy estimated to be generated from these reserves through UCG is equivalent to about 15,000 billion cubic metres of natural gas. In addition carbon dioxide, the main by product of the produced gases can be utilised in enhancing recovery of heavy oil which has been discovered in the area.

Valuable scientific data have been collected from UCG-1, an information well drilled to the depth of 1,005 mt in 1986. The coal and core samples collected at various depths have been tested for different parameters and the results indicate that the coal is low-rank, soft brown, ligno-bituminous with high temperature and volatile contents. It has also been found that this coal is highly reactive with carbon dioxide and steam, making it a suitable candidate for underground gasification.

Three-dimensional seismic surveys have also been conducted at the proposed pilot project site near UCG-1 well to confirm continuity, frequency and alignment of coal seams and to locate presence of faults, foldings and other tectonic disturbances. For the first time in the country, scientists at the ONGC processed and interpreted three-dimensional seismic data. Based on these results, second information well UCG-3 was drilled in a fault-free zone, at a depth of 1,160 mt.

Scientists at the Keshav Dev Malviya Institute for Petroleum Exploration, Dehra Dun said that the Project and Development India Ltd. has been chosen for carrying out detailed process designing and engineering for surface facilities for the pilot plant. The drilling of the horizontal well is being entrusted to M/s. BME of Belgium, which has been selected as an overseas backup

consultant. The Rs. 16-crore pilot plant is being funded by the Oil Industry Development Board. But there are problems regarding availability of funds in advance, owing to the resource crunch in the Eighth Plan, which have to be tackled.

GSFC PLEA FOR IFC AID

Gujarat State Fertilizers Company Ltd. (GSFC) has requested the International Finance Corporation (IFC), Washington, to provide financial assistance for phase II of caprolactam expansion of another 50,000 tonnes.

This request was made by Mr. H.R. Patankar, Chairman of GSFC before the four member team of IFC who visited the GSFC in connection with the on the spot study of the progress in construction of the phase I expansion and to assess the economic viability of the phase II expansion.

GSFC has received financial assistance to the tune of \$28 million from IFC for its phase I expansion of 50,000 tonnes caprolactam project, the construction of which is in full swing. The company was holding a letter of intent for one lakh tonnes of caprolactam expansion.

Mr. Patankar explained to the team the demand and supply position of caprolactam upto the year 2000, and emphasised the need for initiating the phase II expansion work simultaneously with the phase I expansion because of the advantage of availability of common facilities and utility services. He said that early initiation of the phase II expansion would keep down the cost, putting the company in a very advantageous position in the market.

The IFC Vice President, Mr. J. Parmar, sought certain clarifications and indicated a positive inclination to the proposal. It is expected that substantial progress would be achieved in the next round of talks to be held very shortly.

Coal price hike on cards

A rise in the prices of coal is in the offing following the steep hike in petroleum prices and all other inputs. The Bureau of Industrial Costs and Prices has recommended that there should be an annual review of prices of coal, depending upon the cost of inputs and rise in wages, according to a Coal India spokesman.

On the basis of these factors, a 15 per cent rise in the prices of coal is on the cards. The spokesman said input costs have been going up as heavy earth moving machinery, operating in open-cast mines, which account for 60 per cent of Coal India's production are run on diesel, whose costs have gone up by 25 per cent.

The costs of lubricants have also gone up, so also the wages. Moreover, the cost of carrying coal from pit head to the rail head, which is borne by Coal India have also gone up. The wage bill has

gone up by Rs. 300 crores and the cost of labour amenities were also going up substantially, the spokesman said. A major programme of improving the quality of life of workers, which is far below that in the steel industry, has been taken up by Coal India, he said. Coal India has been incurring heavy losses right from its inception, amounting to Rs. 2,250 crores.

However, by efficient management of resources, including better inventory control, higher production and productivity, Coal India made a profit of over Rs. 70 crores during the last financial year, in spite of the fact that wage bill had gone up. Coal India has been facing a number of problems in maintaining its production in the current financial year. Unprecedented and unseasonal rainfall in the eastern region had affected production in Raniganj and Jharia coal fields, which produce high grade, non-coking coals respectively. A number of

mines were flooded. The problem was further compounded due to frequent power failure. The power situation has not improved even now, the spokesman said.

The total loss of Eastern Coalfields Ltd., Bharat Coking Coal Ltd., South Eastern Coalfields Ltd., and Central Coal Fields Ltd., due to the above factors and labour problems, including stoppage of production and rail movement by Jharkhand Mukti Morcha in September and October is of the order of four million tonnes. However, consumers, other than the steel sector were supplied adequate quantity of coal, he said. The despatches in the last six months this year are 96 million tonnes compared to 94 million tonnes in the corresponding period last year, the spokesman said.

GO-SLOW HITS BAILADILLA ORE OUTPUT

Iron ore supplies from the Bailadilla mines to Vizag Steel Plant and also exports to Japan are stated to have been severely hit following a "go-slow" agitation by workers. Against a normal movement of 9 to 10 rake loads of ore, only 3 to 4 rake loads per day are presently being moved. Over 3,000 workers at the Bailadilla mines have resorted to 'go-slow' tactics since the last eight weeks demanding payment of regular bonus to even those drawing above Rs. 2,500 salary per month. In addition, the workers have also sought a far higher incentive bonus.

It is understood that the management of the National Mineral Development Corporation has been holding talks with the workers regularly but they were of no avail so far. The workers are demanding that the incentive bonus be increased to six times the present rate. During this season normally Bailadilla produced an average of six lakh tonnes of iron ore every month, which has fallen to around two lakh tonnes following the go-slow.

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SPOTLIGHT ON**Biotechnology & Life Sciences (Part 2)****THE MASTER GENE ON THE Y CHROMOSOME IDENTIFIED BY MOLECULAR BIOLOGISTS**

A British research team working under molecular biologist Andrew Sinclair at the Peter Goodfellow's Laboratory in London has won the race to find the 'master gene' on the Y Chromosome that causes a mammalian embryo to develop as a male.

Although the complete gene has yet to be cloned, the scientists are confident that they have found the gene that induces the formation of testes in a young embryo — the so called testes —determining factor (TDF).

The above research team has found the gene in a segment of DNA on the short arm of the Y-Chromosome, which they had cloned last December (1989). This newly discovered gene — called SRY for sex determining region, Y chromosome — has a counterpart on the Y chromosome of other placental mammals, including chimpanzees, rabbits, pigs, horses, cattle and tigers.

The researchers have also shown that the equivalent of the SRY gene in mice is active only in the testes. This evidence thoroughly supports the idea that the SRY gene is the elusive testes determining factor.

In the absence of Y chromosome and by implication of the TDF gene, the embryo develops the internal ducts and external genitalia of a female.

So, many researchers see the TDF gene as a 'genetic switch' which in turn activates a cascade of genetic events that lead to the formation of the male reproductive systems. Understanding the mode of action of TDF may provide a general model for the genetic control of developmental decisions in mammals.

(*New Sc.*, 7/21/90, p. 28).

WHAT IS THE HUMAN GENOME PROJECT

The Human Genome Project is in the limelight in scientific journals as well as in the lay press. However, very few among the laymen have a proper perspective or understanding of this project in the human molecular biology. Therefore, its description in the layman's language is very essential. The goal of the Human Genome Project is nothing less than a complete understanding of the genetic basis of *Homo Sapiens*, including the genetic basis of disease.

The human genetic blue-print — the human genome — contains an estimated 100,000 genes, which encode information in DNA for making a human individual in the first place, and for maintaining the individual in his/her daily life. These genes are distributed among 23 pairs of chromosomes (22 pairs of so called autosomes and a pair of sex chromosomes X and Y). Each chromosome contains a long DNA molecule combined with various protein molecules, which determine the overall structure of the chromosome. The DNA molecule is composed of four such units known as nucleotide bases, linked together in varying combinations of order like beads in a string. There is a total of 3 billion bases in the human genome.

Only 2% of human genes have so far been pinpointed to specific chromosomal locations and only a handful of some 4,000 genetic diseases are understood at the molecular level. The Human Genome Programme aims to locate the position of all these genes and to read the genetic information encoded in them including diseased genes. Several levels of attack are planned; first the genetic map, secondly the physical map and

thirdly the complete DNA sequence.

By studying the inheritance pattern of certain characteristics — including diseases, physical traits and arbitrary genetic markers — geneticists are able to build up a picture of which genes are located close to which other genes. For instance, the genes for characteristics that are always inherited together must be located close to each other or the same chromosome. Genes for characteristics that are inherited together frequently but not always are probably located on the same chromosome, relatively close together. Co-inheritance of characteristics at levels no better than chance probably indicates that the genes are on different chromosomes.

Extensive analysis of this sort produces a map that shows the genes — but not absolute — location of the genes for these characteristics, as they occur on the chromosomes. Genetic mapping has long been an established activity among human geneticists, but is being boosted among the Human Genome Programme.

A physical map is a description of the genome in which the distance between certain landmarks has been worked out in terms of actual length of DNA, not inferred indirectly from inheritance patterns. The existence of a physical map will allow researchers to be able to pinpoint precisely the position within the genome of any piece of DNA in which they are interested. Physical maps are established by breaking up the genome into manageable fragments of DNA, identifying the fragments in some way and then determining how the different pieces physically react to each other. It is like assembling the pieces of a jigsaw back together, to get a picture of the whole. Genome mapping of this sort is a relatively new enterprise, and the goal of the Human Genome Programme is to

have a complete physical map of some kind within 5 years.

A read out of the order of the nucleotide bases that constitute the DNA molecules in the 24 chromosomes—the genome—is known as the sequence. In principle, every element of the genome—genes, control regions, other regions—will be visible and identifiable and the instructions they contain interpretable. Of all the parts of the Human Genome Programme, obtaining the sequence is the greatest challenge, with a target date set at 2005 A.D.

The boldest biological endeavour ever undertaken, the Human Genome Programme will cost about \$ 3 billion over a period of 15 years. (*New Sc.*, 7/21/90, p. 35).

PRIMATOLOGICAL FIND OF THE CENTURY

Biologists have expressed surprise that an unknown monkey discovered in Brazil last July, has not been found earlier. The National Museum in Rio de Janeiro announced last July that the black faced *non tamarin* was found in an island near Sao Paulo, one of the world's most densely populated region.

The monkey about the size of a squirrel, has a lion like mane and a striking gold and black coat. Russell Mittermeier, a primatologist, who is the president of Conservation International described the find as 'one of the most amazing primatological discoveries this century'. What was so surprising was to find a new primate in an area so developed. (*New Sc.*, 7/3/90, p. 38).

CEMENT INDUSTRY — A GREAT PRODUCER OF GREENHOUSE EFFECT

Cement industry is the biggest factor for greenhouse effect. Concrete or rather, the cement from which it is made chokes our towns and cities, but its manufacture is choking the atmosphere.

The demand for cement now runs at about 800 million tonnes per year worldwide.

To produce the gigantic amount means heating limestone and clay at temperature up to 1,450°C. Not only does this heating use fossil fuels, which produce CO₂, but the actual process of cement-making, drives off enormous quantities of the same gas. This happens as the limestone CaCO₃ is converted to calcium oxide CaO and its dreaded CO₂ escapes. Heat 1,000 kg of limestones and you release 440 kg of CO₂.

Assuming that 500 million tonnes of limestone are used for this purpose each year, than more than 220 million tonnes of CO₂ are spewing into the atmosphere from cement works alone. This represents more than 44 kg, or a million litres of this gas for every inhabitant on the planet every year. (*New Sc.*, 6/30/90, p. 91).

OSMOSIS HARNESSSED TO GROW SINGLE CRYSTAL OF A PROTEIN

Researchers have employed Osmosis to grow better crystals of a protein. By allowing water to diffuse slowly by osmosis out of a solution of a protein researchers at the National Institute of Standards & Technology (NIST) in USA have produced perfect single crystals.

Single crystals of protein are an essential first step for the biotechnology industry. A protein cannot be modified into other more useful molecules until its structure is known. This is found using x-ray crystallography, analysing the pattern of x-rays scattered after passing through a crystal of the protein. This demands pure, single crystals of between 0.4 and 1 mm. lot.

But such crystals are notoriously difficult to grow. Now researchers at NIST have devised a technique that makes use of osmosis; a process in which water

passes spontaneously from a dilute to the concentrated solution through a semi-permeable membrane, which is permeable to water but not substances dissolved in it.

The researchers used a cellulose acetate membrane to seal one end of a cylinder containing a dilute salt solution and dissolved lynzyme, an enzyme that breaks down bacterial cell walls. The cylinder was placed in a larger one containing a concentrated salt solution. As water moves from the dilute solution, it eventually becomes supersaturated with the protein, and crystals form. After about 9 days, the researchers harvest the crystals.

The key to the success is that by increasing and decreasing the concentration of the salt solution, the researchers can control the rate of nucleation, the first step in crystallisation. If crystals form too quickly the result is a large number of small and often imperfect crystals. The research team believes their method could be adapted to produce large single crystals of cytochrome C, concanavalin A, haemoglobin and zeolites. (*New Sc.*, 7/28/90, p. 32).

CALGENE RESEARCHERS CLONE A GENE FOR STEAROYL-ACP DESATURASE

Calgene scientists have cloned a gene for stearoyl-ACP desaturase, a key enzyme in the formation of vegetable oils used in both foods and industrial applications. The company hopes to produce new vegetable oils from genetically engineered and nutritionally improved canola. The desaturase enzyme determines the ratio of saturated to unsaturated fatty acids in the oils.

Calgene Pacific of Australia and Sanitory of Japan, have recently come to agreement to form a worldwide joint venture to develop and commercialize, genetically engineered roses with extended vase life and blue colour.

In this project Santory is to invest A\$5 million dollars. (*Chem & Ind.*, 7/16/90, p. 447).

HUMAN GENES FOR NERVE RECEPTORS CLONED

Neurogenetic Corporation has cloned the human genes for 12 nerve receptors for use in screening in therapeutic agents. Five of these receptors are novel and proprietary.

The company is now seeking licensing or collaboration agreements for the receptors with pharmaceutical companies.

The receptors include the first clones of human 5 HT₁₀ and adrenergic alpha-2b receptors and also 5 HT₂ and dopamine receptors.

The company has also developed an assay which measures how the function of receptors is changed by the binding of ligands, using an adenylate cyclase coupled receptor system.

Neuro Genetics is setting up a medicinal chemistry department to exploit the receptors in designing and developing patentable drug compounds. (*Scrip*, 1523, June 15/1990).

NEUROPEPTIDES FROM SNAIL VENOM IDENTIFIED

Recent research in USA has shown that venom from predatory cone snails of the genus *Conus* contain a remarkable diversity of pharmacologically active small neuropeptides (typically 10-30 amino acids) that may have pharmaceutical potential comparable to plant alkaloids or fermentation products of microorganisms.

These peptides have various targets in the neuromuscular system including voltage sensitive calcium channels, sodium channels, N-methyl-D-aspartate (NMDA) receptors, acetylcholine receptors and vasopressin receptors. (*Science*,

7/20/90, p. 257).

GENEX GRANTED US PATENT ON SINGLE-CHAIN ANTIGEN BINDING (SCA) PROTEIN TECHNOLOGY

Genex (USA) has been issued a broad US patent for the single-chain antigen-binding (SCA) protein technology. The company believes the bioengineered molecule could replace antibodies in medical therapy and diagnosis, notably cancer treatment and detection.

Other potential applications include the treatment of cardio-vascular and certain infectious diseases. Genex reports that SCA proteins represented an enormous worldwide market opportunity in the diagnosis and treatment of life threatening diseases. In order to commercialize its protein technology as quickly as possible, the company plans to collaborate with corporate planners 'replacing their monoclonal antibodies

(MAB's) with better performing SCA proteins. Researchers at the US National Cancer Institute recently reported the first successful in-vivo targeting of tumours using the Genex protein in mice. (*Scrip* 1542, Aug. 22/1990, p. 19).

BIOLUMINESCENT REPORTER FOR NAPHTHALENE

Inserting the luciferase genes associated with bioluminescence into a naphthalene catabolic plasmid yields an inducible bioluminescent plasmid that can be used as reporter for environmental naphthalene. According to researchers at the Univ. of Tennessee's Centre for Environmental Biotechnology and at Oak Ridge National Laboratory (USA), bacterial strains harboring the recombinant plasmid produce enough light to serve as biosensors of naphthalene exposure and biodegradation. The researchers believe that bioluminescent bacterial strains could also be developed for other chemical agents and

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that such reporter organisms could be immobilised on fibre optic probes for on-line monitoring and process control applications. The recombinant strains could also be useful as specific sensors for chemical agents in mixed culture biological processes (such as waste treatment) and environmental systems (such as groundwater). (*Science* 249, 778 (1990)).

MADAGASCAR'S FABULOUS FLORA & FAUNA

In many respects Madagascar could be the original for Arthur Doyle's 'Lost World'. Millions of years of geographical isolation have left the island brimming with huge numbers of species — both of plant and animal — that are found nowhere else on Earth. For instance Madagascar has nearly as many primate species as the rest of Africa, a thousand endemic orchids, two thirds of the world's species of chameleon and seven of the world's nine baobat trees. Its rivers contain unknown species of

crocodiles, some of which are as long as six metres.

Madagascar's best known species are the lemurs, primitive primates that monkeys have supplanted everywhere else in the world. The Ankarana district of Madagascar harbours at least 10 kinds of lemurs, nearly half of the world's species. Madagascar's fabulous flora and fauna is now threatened by modern man's hunger for wood. Logging and timber exploitation is threatening to wipe out this wealth within a decade or two. (*Lemurs of the Lost World* by Jane Wilson) (Harrap/Impact pp, 216.).

UK SAYS NO TO COMMERCIAL MARKETING OF BST

The UK Veterinary Products Committee does not believe Monsanto's bovine somatotropin (BST) product is ready for a commercial licence at present. The VPC, an advisory committee of the Ministry of Agriculture's Veterinary Medicines Directorate,

reviewed an extensive dossier of data in several years' trials of the genetically engineered hormone. According to Monsanto it found 'a few issues of concern remain'. Areas of concern are associated with the pharmaceutical process conditions of full commercial scale production, together with 'some specific aspects of animal safety' according to the company. Full details are expected to be released shortly. However, the VPC found BST posed no risk to either human safety or the environment'. It is also satisfied with the claims of product efficacy demonstrated by the trials. When further details on the VPC's preliminary recommendations are available, Monsanto plans to 'make use of the Medicine Commission's appeal procedure to provide adequate data and reassurance on process conditions to resolve the remaining concerns'. Monsanto's BST product has already been licensed for use in seven countries —USSR, Czechoslovakia, Bulgaria, South Africa, Namibia, Mexico and Brazil. (ECN., 8/6/90, p. 20).

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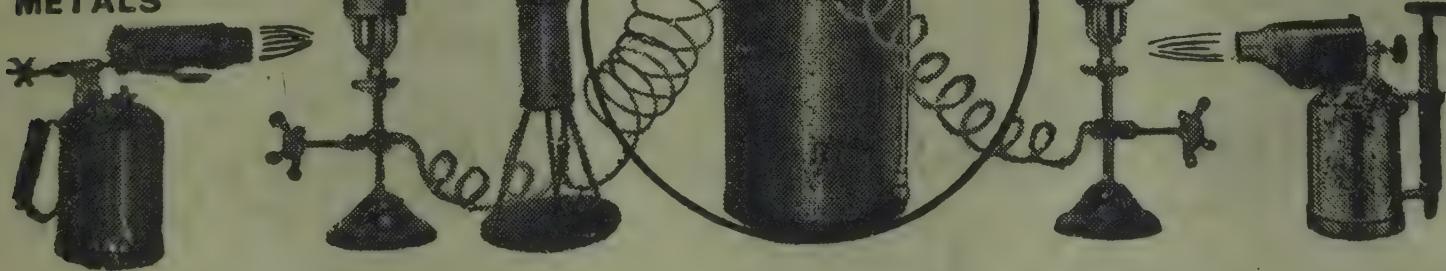
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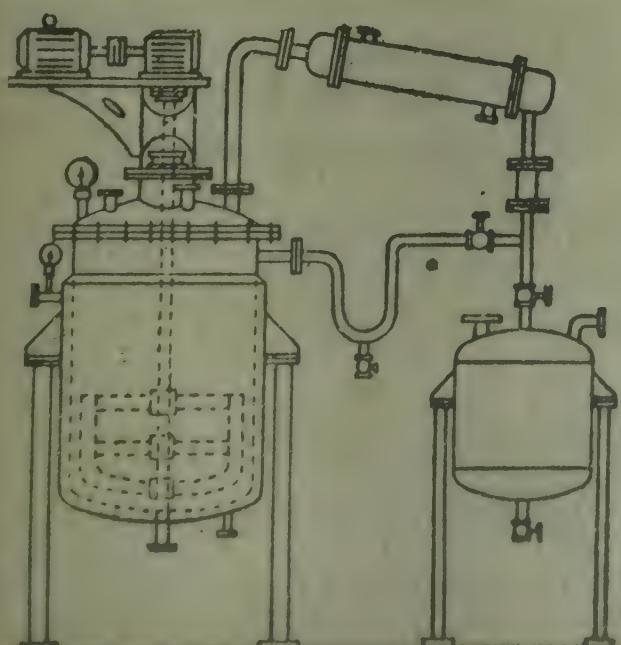


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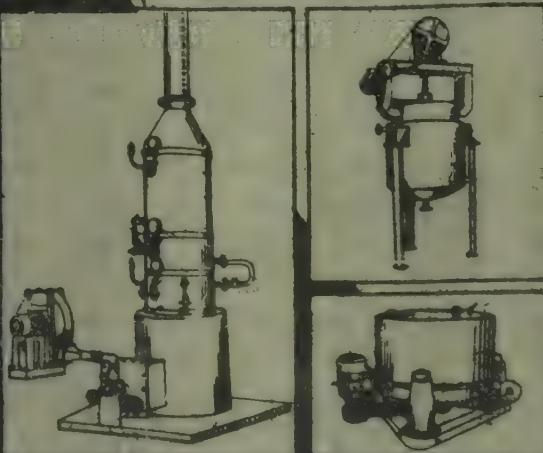
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Food & Pharmaceutical Technology In Perspective (Part 1)

A BIOTECH PROCESS FOR BULK PRODUCTION OF DEXTRAN FROM SUGAR & WASTE COCONUT WATER

The Philippines Industrial Technology Development Institute (ITDI) has developed a biotech process that uses the country's excess sugar and waste coconut water to produce dextran sulfate for pharmaceutical use. The method uses a substrate of sucrose and coconut water to produce dextran sulfate from dextran sucrose. The TDI is now setting up a pilot plant to demonstrate the process.

The ITDI's microbiology and genetic division recently reported that the process is industrially feasible and cheaper than using a yeast substrate. Plans include the development of iron dextran and pharmaceuticals that activate the immune system.

Some 4,000 million litres/year of coconut water are thrown away by 10 desiccating plants in Philippines. The above technology will utilize the above waste product and save considerable amount of valuable foreign exchange. The Philippines currently imports all its dextran requirements. Most of it is used to extend blood plasma, and as an iron-complexing agent to prevent anaemia. The above Philippines technology for dextran is worthy of study by Indian entrepreneurs and CFTRI (Mysore) as both sugar and coconut water are available in plenty indigenously. (ECN, 9/10/90, p. 31).

A NEW TYPHOID VACCINE FROM INSTITUT MERIEUX (FRANCE)

Institut Merieux (France) has begun marketing a new typhoid vaccine Typhus VI, developed in conjunction with the US National Institutes of

Health. Merieux claims that the vaccine acts within 15 days and lasts up to three years. (ECN, 9/10/90, p. 26).

JAPAN FOOD ADDITIVES ASSOCIATION TO UPDATE VOLUNTARY STANDARDS FOR FOOD ADDITIVES

Japan Food Additives Association will update in 1990 the voluntary standard for, and outline for use of natural additives in foodstuffs and lessen the number of artificial additives. In Japan all food products will be required as from July 1991, to specify on their packages both the artificial and natural additives contained.

The above association intends to revise the existing standard for 42 natural additives used in Japan by adopting a new evaluation method and also add some of the food additives which have not been used in Japan, but for which safety has been confirmed by UNO. The Japanese Association plans to establish in 1990 the voluntary standard and guidelines for a total of about 60 natural additives, in a bid to comply with the international standards.

In Japan, no control has been imposed on natural food additives unless specified by the Food Sanitary Laws. The Association has introduced the voluntary standard and outline over the past 9 years covering the 42 said items — 20 colorants, 15 viscosity stabilizers, 3 sweeteners and 4 others, but their evaluation method is now considered to be obsolete. (Japan Chem Wk., 5/10/90, p. 1).

USDA'S COLOUR STANDARDS FOR FRENCH FRIED POTATOES

The high standards of food processing in USA make it imperative to have colour standards for French fried potatoes.

We Indians can never even imagine standards for French fried potatoes. The USDA has recently issued a fourth edition of colour standards for French fried potatoes.

The standards, which will provide a means of classifying the colour of these products, consists of a series of colour references depicting changes that occur because of the frying process. They provide easily understood designations of the various colours for standardization, quality control, inspection and specification. For further information contact: Munsell Colour St, Baltimore, M.D. 21281, USA. (S.N., 7/1990, p. 12).

ENCAPSULATED CORN POPS BETTER IN MICROWAVE

A US Patent (US Pat. 4,880,646) has been granted to chemist Chef Lew and D Barlow. The patent covers a way to make and encapsulate corn kernels to make an improved microwaveable popcorn. The patent has been assigned to Southwest Research Institute.

The first of the 10 claims in the patent specifies, 'Encapsulated corn kernels consisting essentially of kernels of corn suitable for popping, coated over at least a portion of the outer surface thereof with an edible oleaginous substance or edible wax and thereover with an outer shell of an edible polymer'.

The resulting kernel is reported to pop more quickly and completely than other microwaveable popcorns. Further the kernels can be popped in a paper bag, which is cheaper than conventional microwave packaging, not to mention being biodegradable.

Several food manufacturers in USA are keen to commercialize the new technology. (C & EN., 9/11/90, p. 92).

ENZYME-BASED THINNING AGENT FOR CEREAL FOOD FOR BABIES DEVELOPED BY RESEARCHERS AT MS UNIVERSITY, BARODA

The researchers at the Faculty of Home Science, the Maharaja Sayajirao University, Baroda have developed an enzyme based thinning agent for cereal foods for babies of 6 months to 36 months. The thinning agent based on the enzyme amylase is used to produce the so called amylase-rich food (ARF). The ARF would help to increase the intake of cereal food by children in the age of group of 6 months to 36 months and improve their health.

The ARF has already been approved by the WHO and has been found useful in improving the growth of undernourished children according to the reports from Prof. Tara Gopaldas of MS University, Baroda. It took 10 years of research to develop the enzyme that makes the cereal gruel thinner and easy for the children to gulp and digest.

The ARF was developed with the financial assistance from International Development Research Centre (IDRL) Canada. The Food & Nutrition Dept. of MSU plans to share the experience with leading scientists worldwide and popularise the product in India and South East Asian countries for improving the health of under nourished children in the Third World Countries.

According to Prof. Gopaldas of MSU the Agroindustries Corporation of Gujarat, Andhra Pradesh and Karnataka have already shown keen interest in bulk production of ARF, which is a special form of germinated cereal grain powder.

BROILER RABBIT MEAT TO CHALLENGE MONOPOLY OF CHICKEN & MUTTON IN INDIA

Indian meat consumers would soon

be able to buy broiler rabbit meat in the market. This will break the monopoly of mutton and chicken meat and offer a cheap alternative for non-vegetarian processed foods, as well as home cooking.

The ICAR has succeeded in selecting broiler type of rabbits that achieve 2 kg body weight in just 12 weeks. The parenteral stock used in this selection research are the Soviet Chinchilla grey giant rabbit and white giant rabbit from New Zealand. These exotic breeds were procured by the ICAR to evolve a meat rabbit variety suitable to Indian taste and conditions. Rabbit is a prolific multiplier, which can be bred on agricultural waste and has the potential to provide high-quality animal protein equivalent to mutton and chicken at a low cost.

CHEESE FROM PEANUTS ON THE FOOD HORIZON

Food researchers at the Univ. of Wisconsin (USA) are confident of producing cheese from peanuts for better nutrition in the near future. According to researcher B.L. Santos (Univ. of Wisconsin), the protein content of the peanut based imitation cheese spread was almost twice that of commercial cheese products. This imitation cheese will be an ideal protein food for underdeveloped countries as well as for protein starved vegetarian country like India. This peanut based imitation cheese will have longer shelf-life than milk-based cheeses without refrigeration. The researchers are confident of developing a palatable product as a substitute to the dairy cheese.

MONSANTO CLAIMS TO MARKET WORLD'S FIRST FAT-FREE ICE CREAM

The American company Monsanto is now licensing what it claims is the world's first fat substitute for use in ice cream and ice cream products. The world's first fat-free ice cream for the

obese will soon hit the US food market soon. A popular ice cream sandwich now contains 6 gm of fat containing 180 calories. With the new product, it will have no fat and just 130 calories, reports Monsanto.

PRAWN CULTURE GETS A BOOST FROM RESEARCH AT CENTRAL INSTITUTE OF BRACKISH WATER AQUACULTURE (CIBA)

Prawn farming is progressively expanded in India from research support from the Central Institute of Brackish Water Aquaculture (CIBA). This farming is extended to 100,000 hectares of the coastal brackish areas of the country to tap the employment and foreign exchange earning potential. CIBA has also sub-stations in West Bengal, Orissa, Andhra Pradesh and Kerala. A new substation is being set up in Gujarat.

According to Dr. K. Alagariswami, proper research support and matching policy could boost prawn farming in India as the Indian climate is congenial to intensive prawn farming. Dr. Alagariswami estimates that India's total production of cultured brackish water prawns can hit 120,000 tonnes/year by 2000 A.D. The recent policy in favour of leasing government brackish areas for farmers, cooperative and private enterprises has given a boost to prawn farming. However, the real bottleneck is the scarcity of prawn seeds and feeds.

India has a long way to go before it can catch up with Taiwan in prawn culture. Taiwan has raised its cultured prawn exports from 5,000 tonnes to 100,000 tonnes in ten years.

JAPAN DEVELOPS EDIBLE GEL

Takeda Chemical Industries Ltd. of Japan has developed a polysaccharide food additive called 'Curdlan' which coagulates on heating to form a stable

gel. Curdlan is a fermented polysaccharide produced by the microorganism *Alcaligenes Facalis* cultured in grape sugar, a nitrogen source and small traces of minerals. Curdlan is insoluble in water, can form a suspension in solution which coagulates when heated. The gel is heat stable and does not degrade even when heated to 120°C.

When heated Curdlan is converted into a three dimensional netted construction by a hydrophobic bonding, which may be why it does not melt when cooled and reheated. The polysaccharide consists of 98% edible fibre. (*Food Manuf.*, 5/1990, p. 18).

NEW HYDROGENATION PATENT ISSUED TO RIMECO (USA)

Rimeco Inc. (USA) reports a system for measuring oil quality during continuous hydrogenation will be available for retrofitting existing plants. The firm recently received US Patent 4,871,485 covering a process for continuously hydrogenating edible oils which measures the changes in oil quality nearly instantly. The firm reports the new technique provides computer control of oil quality. (*INFORM*, 2/1990, p. 112).

FDA IN USA CERTIFIES NEW CASTOR OIL USE

The FDA in USA has amended the food additive regulations to provide for the safe use of hydrogenated castor oil as a component in olefin polymers intended for use in contact with food. The amendment was made in response to a petition filed by Riken Vitamin Co. Ltd., (*INFORM*, 6/1990, p. 556).

FOOD RESEARCH IN USA PROVES RICE BRAN AS A NEW CHOLESTROL REDUCING AGENT FOR HUMANS

The result of the first clinical study on rice bran in USA to examine the effect of rice bran added to the diet indi-

cate that the product is effective in reducing cholesterol levels in humans.

Total blood cholesterol levels decreased approximately 8% in subjects given a rice bran supplement for 6 weeks with a 14% decrease in LDL, cholesterol. Apolipoprotein-B, which also has been linked to coronary heart disease, was reduced significantly, in participants receiving the rice bran product.

The Australian study commissioned by the Rice Growers Cooperative Ltd. and conducted by Paul J. Nestel of CSIR, Australia also examined the laxative effect and glucose tolerance of rice bran. Rice bran was found to be equal to wheat bran and superior to oat bran in terms of laxative effect, while all three proved equal in glucose tolerance effects.

The results of the above studies have prompted Quaker Oat Co. and Ralston Purina Co. in USA to introduce new rice bran based ready-to-eat cereals. Ralstan reported it planned to introduce Rice Bran Options nationally in January 1990, while Quaker reported it would introduce its Quaker Crunchy Rice Bran during February 1990.

In related news, Pacific Rice Products which manufactures a variety of rice bran and rice germ products in USA, reports it will build a 100,000 sq. ft. addition to its plant in Woodland, California. (*INFORM*, 2/1990, p. 111).

PLANTS & FUNGAL ENZYMES REPORTED AS NEW SOURCE OF OMEGA-3 FATTY ACIDS

Recent study on range fed chicken on a Greek farm, where chickens are fed purslane, has shown that these chickens produce eggs such in omega-3 fatty acids. Some years ago, Norman Salem (Jr) a lipid biochemist (at the National Institute of Alcohol Abuse & Alcoholism) has shown that purslane, a weedy herb is the richest source of omega-3

fatty acids among the leafy greens.

The researchers studied the omega-3 fatty acids content of eggs from the chickens fed on purslane. They have found that eggs contained 300 mg of omega-3 fatty acids — the same amount contained in a standard fish oil capsule and 10-times greater than that found in a typical US supermarket egg.

American biotech researchers expect that a year or so of concentrated effort could result in the biological transfer of eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA) into fruits and vegetables. One food company in USA has shown interest in introducing these fatty acids into salad oil.

Many species of phytoplankton as well as a few fungi have been reported to produce significant quantities of the two fatty acids. These organisms provide a potential source of genetic determinants specifying the production of these compounds.

Since the evidence to date suggests that the plant and fungal enzymes can use existing plant fatty acid precursors, the ability to produce polyunsaturated fatty acids (PUFA) could potentially be transferred in future into edible horticultural plants. Although, some researchers consider that transforming the host plant with the algase genes is a major hurdle, it is an attainable goal. (*INFORM*, 2/1990, p. 112).

A BLUEPRINT FOR THE DEVELOPMENT OF FOOD PROCESSING INDUSTRY IN PUNJAB, KASHMIR, HARYANA & HIMACHAL PRADESH

Federation of Indian Chamber of Commerce & Industry (FICCI) in collaboration with Confederation of Food Trade & Industry (CIFTI) is drawing up a blueprint for development of food processing industries in Punjab, Jammu and Kashmir, Haryana and Himachal Pradesh.

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Mr. S.P. Virmani, President of CIFTI has recently said that the FICCI-CIFTI action plan will spell out the policy changes required for promoting food processing industry in north India, type of linkages required between agriculture and food processing industry, region specific industries to be set up in that area, type of fiscal and other support required from the government for promoting the food processing industry. To crystallize the policy, parameters required for boosting the food processing industries in north India, Mr. Virmani reported that FICCI in collaboration with CIFTI is holding a seminar on 'Opportunities and Challenges for Development of Food Processing Industries' on October 26th at Chandigarh.

The seminar is being organized with the active support of the food processing ministry in the government of India and state governments in northern India. A large number of entrepreneurs are expected to attend to discuss the possibilities of setting up food processing industries, particularly for processing fruits, vegetables and dairy products. (TOINS, 10/21/90, p. 14).

A NEW EFFICIENT TIME-SAVING HYDROTHERMAL PROCESS FOR COMMERCIAL PRODUCTION OF CHITOSAN

A Japanese research group at Faculty of Science, Kochi University, Japan, has developed a new time saving process for commercial production of Chitosan from chitin within 2 hours. The conventional process in vogue at present takes a few days to produce chitosan from chitin. In the new hydrothermal process the cuticle is treated with hydrochloric acid. The resultant product is then delimed in an autoclave for an hour at temperature around 120°C. The delimed product is then deproteinized and deacetylated in an autoclave for about an hour under alkaline (sodium hydroxide) hydrothermal conditions at a temperature around 150°C to produce chitosan of high purity.

The company claims that the new process attains a deacetylation rate of as high as 80-95% when 100% pure chitin is subjected to the new process under optimum conditions. The process besides being time saving helps drastically reduce production costs. It is also more precise and controls the molecular weight of chitosan produced. By varying the deliming temperature the molecular weight of chitosan produced can vary from 5,000 to 2,600. The higher the deliming temperature, the smaller the molecular weight of chitosan produced. (Japan Chem Wk., 6/7/90, p. 1).

A NATIONAL ALTERNATIVE TO MONOSODIUM GLUTAMATE (MSG)

Fries & Fries Inc. (USA) has recently developed and marketed a natural 'alternative to MSG for processed foods'. The replacer can be added to processed meats such as sausages, sauces for meats and vegetables, seasonings, condiments, gravies, marmalades, soups and chinese foods. It is offered as a dry powder. It is stable in microwave ovens, freezing hot fills and retort. (Fries & Fries) 1199 edison Dr. Cincinnati, Ohio, 45216, USA).

A NEW PROCESS TO REFINE CRUDE RICE BRAN OIL INTO EDIBLE GRADE

Bharat Edible Oils & Fats Ltd., (Bombay) has developed an indigenous process to refine crude rice bran oil into edible grade. The new process based on molecular distillation technique can refine crude bran containing free fatty acids (FFA) up to 69%. This process has undergone pilot tests in West Germany. The process claims several advantages. It eliminates the use of toxic hexane and alcohol and has the flexibility to refine any kind of high FFA oils into edible grade. Further, it is pollution free, reduces consumption of caustic soda by more than 80%, saves energy (up to 70%) with low capital costs. It recovers Vit E and yields high quality oil.

Decision on capacity creation in chemical industries

N.S.VENKATARAMAN*

It is generally agreed, even by discerning observers from Western Countries, that Indian chemical industries have achieved spectacular growth during the last three decades. There are few chemicals that are not produced in India, even though the scale of operations and the production capacity levels of chemical industries may be much below the prevailing international standards. The level of Research and Development efforts in the field of chemical technology in India are also of fairly high standards; nearer to levels prevailing in the developed countries than in the developing ones. Inspite of such factors, the contribution of Indian chemical industries to the national income and the export earnings is still nowhere near the desirable levels. The challenges facing the Indian chemical industries are primarily with regard to the operation at high capacity levels in a wider international market.

The decision regarding the capacity of the chemical projects are decided on the basis of the four parameters, viz. proposed investment levels, demand-supply situation for the product in the market, technology factors involved and economic capacity/profitability levels. Of these factors, the Indian entrepreneurs generally provide the highest priority to the demand potentials for the products in the Indian market and the other factors are only considered secondary. Such a conservative and the 'safety-first' attitude on the part of the Indian entrepreneurs have been primarily responsible for the creation of the low production capacity in the chemical industries in India. Unless this 'mental block' of the entrepreneurs and their obsession with only the Indian market are quickly and effectively demolished, there can be no hope that the Indian chemical industries would contribute significantly to the national income in the near future.

While the demand-supply situation is certainly an important factor in deciding the capacity of the projects, this factor should not become the be all and end all of the decision-making process. The decision on the capacity creation solely based on the Indian market scenario, will have the ultimate effect of 'achieving' even a negative growth rate in the chemical industries after a few years. Already, we find that the country is nearly self-sufficient in several chemical products due to the low purchasing power in the country, even though the total capacity created for such products in the country is only a small fraction of the total world production. The Indian capacity for the production of such chemicals do not in any way justify the Indian size and population level, as a percentage of total world figures. The Indian chemical

industries simply follow the economic growth pattern and purchasing power of the consuming centres in the country in creating additional capacities, instead of actively influencing and promoting the industrial and economic growth rate of the country. This can be done by entering the export market in a big way, by putting up large sized chemical projects and operating in the international market.

Indian chemical industries have a lot to learn from small countries like Taiwan, Israel, Japan and South Korea in capacity for chemical industries. The chemical industries in these countries have clearly oriented their thoughts and performance to the international market and have adopted their operational strategies from this point of view. If the industries in these countries were to choose to cater only to their local markets, there can be no doubt that their economies would slide down rapidly, as the purchasing capacity of these countries are not large in view of their small size and the consequent level of low overall demand, though the per capita consumption levels may be higher. It is evident that the battle for the future of the Indian chemical industries will have to be fought and won in the minds of the entrepreneurs of the Indian chemicals industries.

Government of India, on its part, appears to have done everything possible, under the circumstances, to help the Indian chemical industries boost their export performance. The creation of 100% Export Oriented Unit Scheme and the Free Trade Zone effectively protect the Indian industries from the vagaries of Indian economic climate and the tax laws, so that the units can effectively contribute and compete in the international market, by way of technology, investment level, raw materials use and the price factors. Such units are permitted to import the required capital goods and raw materials free of import duty, so that the inputs for the project are available at international prices. The units can draw loan from the international funding agencies for the projects, if they so desire, so that the interest burden for the projects would be on par with the international norms. Further, the units are totally exempted from income tax for the profits earned from exports, which is a factor of encouragement and incentive to the units. Even under such conditions, the Indian chemical industries have not cared to put up large units of international size and enter into the export market in a commendable way. It is difficult to suggest that the Government should do anything beyond this level. One would expect that there is a matching response from the Indian chemical industries, who should be able to shed their conservative approach and come forward to exhibit dynamic and aggressive postures, to win a place for themselves in the

international market. The present average production capacity of the Indian chemical industries are so small, that several of them are not in a position to generate adequate profit and surplus funds to carry out R&D efforts for product improvement and achieve technology optimisation on a continuing basis to boost the sales promotion activities for their products in the world market. The adequately large capacities for the chemical projects are also required to effect deliveries in strict time-bound schedules at competitive costs, which is an essential requirement to operate internationally.

The required level of the process control measures and computerisation to achieve the optimum quality standards can be introduced, only if the plant capacities would be large enough, that would justify the investment in such sophisticated process control instrumentations and shop floor facilities, from the point of view of the overall project costs and the rate of returns. The standing expenses in the units for unit product have to be brought down for operating in a competitive world market, which can be done only in a plant of

adequately large sized capacity.

The export promotional campaign in the field of Indian chemical industries has to be necessarily preceded by systematic and sustained efforts to build awareness and confidence in the minds of Indian chemical industries about the export opportunities and potentials. They must be educated that such opportunities can be profitably availed, if one were to prepare the grounds carefully. The Indian chemical industries should become capable of thinking and acting big in larger environments, instead of being satisfied by producing limited outputs for a limited Indian market.

The Indian chemical industries are now at the cross roads and unless they reorient their objectives and targets urgently, there is a distinct possibility of them becoming counter productive in the limited market opportunities of the slow wheeling Indian economy. The capacity creation of the Indian chemical industries should henceforth be planned from the global market view point, as a necessary measure for its survival, growth and prosperity.

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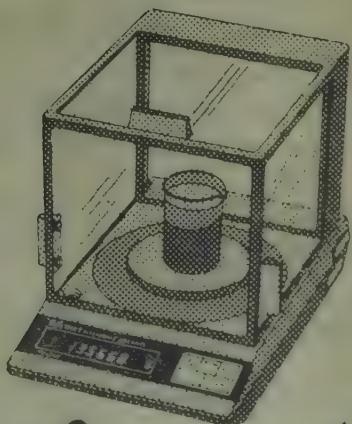
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State-of-art on leather finishing chemicals with regard to their environmental impact*

HELMUT WILL

BASF Aktiengesellschaft, 6700, Ludwigshafen

The contributions of Prof. B.M. Das to the leather industry and technology were numerous and this lecture is being dedicated to his memory. One aspect which had no great relevance during Prof. Das' active life time, but needs attention nowadays, is Environmental Protection. Environmental protection is a new term used in all countries and languages. Ecology was originally the term used to describe the equilibrium of life in the natural habitat. Leather manufacturing is an age old activity and its impact on the natural environment has been a serious consequence long before people began to talk and write about it.

Nowdays we have to consider the following questions; what are the specific and general features in leather manufacturing, their need for ecological considerations? Hides and skins are natural products, in fact byproducts of meat and wool production. Mentioning this, we have touched a very important criterion of leather manufacturing. There are many facts which are practically identical world-wide, but there are always exceptions. Scientists and researchers in many institutes and enterprises develop attractive new methods to manufacture leather and reducing the output of unusable material. There is always, however, at least one traditionally minded tanner in the country who faithfully preserves the old inherited procedure.

Many of the constructive recommendations for an effective environmental protection fail due to the delicate balance in the fields of trade, with supply and demand, fashion, pricing and many other constantly changing conditions. These can only be partly influenced by the individual leather manufacturer. Environmental protection can be approached in several ways. Production forms one end; environmental factors, water-soil-air-samples the other end of the chain. For the individual steps on this path, principle as well as variable cintions count, and it is here that the question is being addressed to the environmentalists, arising the world over: — Would what is being done today remain relevant and right in future?

For about 25 years, the problems of environmental protection have been intensively discussed in the industry all over the world. In the late sixties and in the seventies, the effluent problems were of topical interest; scientists, institutes, leather manufacturers and chemicals manufacturers developed new methods and chemicals to fight water pollution. In the eighties, the discussions have more and more concentrated on air

pollution. The problems of environmental protection have thus

shifted from the wet-yards of the tannery to the finishing department. Air and exhaust air form the most recent chapter in the catalogue of measures, and from the point of view of the environmentalists, this is the most important problem. It affects large areas with minute concentrations and is therefore extremely difficult to keep under control. In densely populated regions, the residential localities have moved closer to the factories. Odours therefore bring the most serious complaints from the public which, due to the nature of the problem are usually justified.

Odour is an individual perception which is difficult to define. If it stinks, something is wrong and so the problem should be tackled at its roots before that turns out into a big environmental pollution problem. In the finishing department solvents are used in the application of the desired and needed coatings. Unfortunately they are not odourless. Regulations of government agencies regarding the emission of solvents into the atmosphere are to a great extent already in existence in many countries. Enforcements of these regulations will make the use of lacquers based on organic solvents more difficult in future.

This means that the traditional finishing system will undergo a drastic change. Waterborne coatings have therefore to be used for finishing and top coating leather, and the application methods have to be modified to reduce the emission of volatile organic compounds (V.O.C.'s). Before discussion of this question, we should have a look at the improvements we can achieve with the existing technology and application methods.

Consider the task of top coating 1,000 hides per day. The top coats used can be either solvent-based lacquers or waterborne lacquer emulsions. There are two different methods of application of top coats. They are spray-coating and roller-coating. The figure shows the approximate amounts of solvents emitted in each method of application and it can be seen that solvent emission can be considerably reduced by using roller-coating application instead of application by spraying.

Lacquer emulsions are not totally free of solvents. They normally contain 40-50% of organic solvents. Therefore, if lacquer emulsions are used as top coats, organic solvents will yet be discharged into the air although to a considerably lower degree compared to solvent-based lacquers.

* Paper presented at the Tanners Get-together, 1990.

Table 1
Emission of solvents
Application of top coat on 1000 hides/day, area 4m²/hide
Solvent-based lacquer top coat

	Spray-coating	Roll-coating
Lacquer formula:		
Lacquer	100 parts	100 parts
Solvent	300 parts	75 parts
Solvent content	95 %	88 %
Usage for 1000 hides/day	600 Kgs.	200 Kgs.
Solvent emitted per day	570 Kgs.	176 Kgs.

Waterborne lacquer-emulsion top coat

	Spray-coating	Roll-coating
Lacquer formula:		
Lacquer emulsion	150 parts	150 parts
Water	100 parts	50 parts
Solvent content	30 %	37.5 %
Usage for 1000 hides/day	480 Kgs.	280 Kgs.
Solvent emitted per day	144 Kgs.	105 Kgs.

We know however, that the physical properties of films formed by lacquer emulsions are not as good as those formed from lacquers. To obtain optimum wet fastness properties with lacquer emulsions similar to that of solvent lacquer top coats, it would be necessary to apply heavier films (Figure-1).

- a. 1 part nitrocellulose, 3 parts lacquer
- b. 1 part nitrocellulose lacquer 1, 1 part water
- c. 1 part nitrocellulose lacquer 2, 1 part water

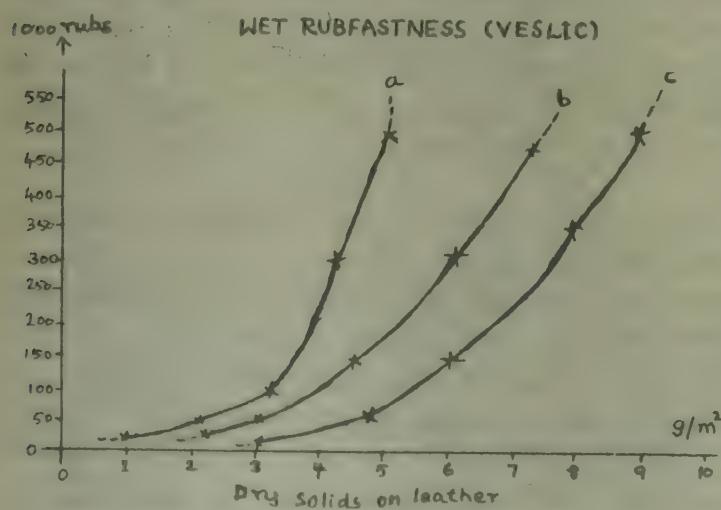


Figure 1.

The next figure shows the relationship of the wet rubfastness to the film thickness of top coats produced with a nitrocellulose lacquer and two different nitrocellulose emulsion lacquers. You can see that 50% more solids with emulsion lacquer 1 and even twice as much with emulsion lacquer 2 are

required to achieve the same fastness level as that obtained with the solvent-based nitro-cellulose lacquer. The illustration also shows that there are substantial differences between the emulsion lacquers in their fastness properties due to the variations of the manufacturing process and the emulsifier content. As a general rule, reduced wet rubfastness will be obtained on the same base coat if the same amount of emulsion lacquer is applied instead of the solvent-based lacquer. For this reason, provisions should be made in formulating the base coat with suitable binders to improve the wet rubfastness. The regulation imposed by the environmental protection authorities in many countries would be significantly lower than the values which can be achieved by current methods. So a final solution of the problem can be achieved only by using solvent-free finishing systems.

In case of low solvent and solvent free finishing systems, the coat cannot be considered separate from the other coats of the finish. The finishing systems under discussions include the base coat, and in certain instances it may even be necessary to prepare the leathers suitably in the retanning and fatliquoring stages. It should be pointed out that these finishing systems have to be suitable for all kinds of leather ranging from soft garment to relatively firm and upholstery leather where the toughest fastness requirements are to be met. Taking into account of the large variety of leathers, a single formulation involving a specific type of base top coats is not adequate. Therefore it is not possible to employ only one class of film forming polymers.

The first group is of thermoplastic and the second group of a non-thermoplastic nature. It is a well known fact that thermoplastic polymers (polyacrylates, polyurethanes, polyacrylic styrene and polybutadienes) possess specific properties which make them especially suitable for use in base coats and that duroplastic polymer (proteins) are particularly good film forming agents suitable for top coats. Fairly hard films are required for top coats to provide for satisfactory abrasion resistance. The selection of duoplastics is difficult especially because the physical properties obtained using protein films do not meet the standards expected of water resistance especially in comparison to nitro-cellulose films. To overcome this problem, special polymers with improved water resistance had to be developed. For this development it was necessary to study first the factors that influence the water resistance of a film. Most important was the investigation on forming a water resistant film from an aqueous polymeric dispersion. An electron micrographic study reveals that the polymer particles gradually move closer together and form a honeycomb structure.

It is important to note that the particles do not fuse even in the final phase of film formation but only their surfaces are in contact with one another. This makes it understandable that the water resistance of a film is dependent mostly

on the character of the surface of the particles. On the copolymerization of hydrophobic and hydrophilic monomers, the hydrophilic monomers, unfortunately, accumulate on the surface of the particles. In the example the acrylic acid has accumulated in the outer sphere of the particles (Figure 2). Because of the high concentration of carboxylic acid in the outer sphere, the water can easily gain access to the interstices between the polymer particles and consequently the waste resistance of the film will be poor.

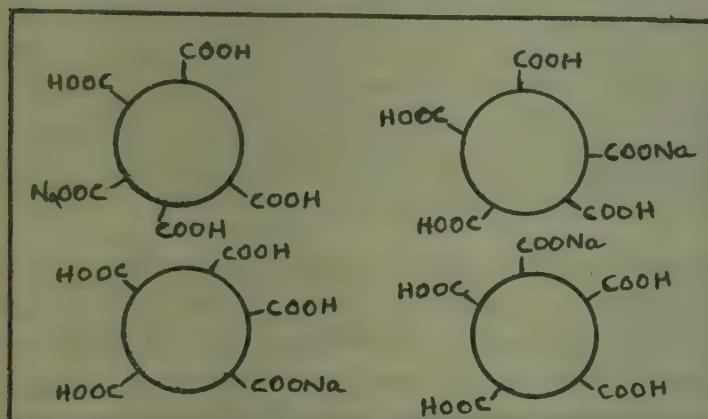


Figure 2

By means of new polymerisation techniques, it is possible to maintain a low proportion of hydrophilic monomers at the surface of the particles and this improves the water resistance of the film distinctly. The improvements achieved however are not yet completely satisfactory. Therefore, the particle size must be brought into the picture. It is seen that the surfaces of contact are smaller on a film consisting of coarse particle size than on a film of a dispersion with finely divided particles.

However, the problem is that high percentage of hydrophilic monomers and emulsifier is needed to obtain a stable and finely divided polymer dispersion. Both have an adverse influence on the water resistance. Under specific conditions, however, this disadvantage can be avoided. It is possible to produce a very finely divided dispersion which forms a highly water resistant film (Table 2).

Table 2

	Normal Dispersion	Finely divided dispersion	Mix of 1+2 1:1
Dry rub	500	500	500
Wet rub	200	400	350

A comparison is made here between the water resistance of films formed by a commercial polyacrylic dispersion and a new, finely divided dispersion. The latter one can even improve the wet rub resistance of the films of other dispersions when applied in admixture with them.

In the context of solvent free finishing systems, the search for waterborne top coats is necessary. One possibility is a dispersion of polyacrylostyrene copolymers which can be applied in combination with a high grade ionomeric polyurethane dispersion and even with protein. Recent development have shown that additional improvements are achieved by addition of coalescent active substances during processing. Flow out, film forming and resistance against high temperature are improved. Furthermore, these coalescent active substances block the hydrophilic groups of the polymer resulting in better water resistance of the film. (Table 3).

Table 3

	Finely divided dispersion	Newly developed finely divided dispersion
Dry rub	1000	1000
Wet rub	100	600
Heat resistance	90°C	160°C

With some of the systems described here solvent free finishes satisfying the physical properties for many types of leather can be formulated. Difficulties, however, will be encountered if very high requirements with regard to rubfastness, abrasion resistance and flexibility required for instance in case of car upholstery leather are to be met. Comparatively heavy finish coats will then be needed which will no longer possess the required flexibility. This problem can be overcome with the aid of cross-linkers. There are at present various products available for cross-linking. They differ from each other in their reactivity depending on the type of polymer used. (Table 4).

Table 4
Types of cross linkers

Type	Temperature required for reaction	Time required for reaction
1. Epoxy compounds	25°C - >80°C	Slow
2. Multivalent metal ions (Zn, Zr)	25°C	Medium
3. Carbodi-imides	25°C - >70°C	Medium/Slow
4. Polyfunctional aziridines	25°C	Very fast
5. Isocyanates	25°C	Very fast
6. Melamine-formaldehyde resin	>170°C	Fast
7. Formaldehyde	25°C	Medium/Slow

Aziridine appears to be the most suitable cross-linking agent for the purpose intended. It reacts with the carboxyl as well as with the hydroxyl and amine groups and it is active even at room temperature. It is effective when it is applied in small amounts. Mainly the water resistance of the finish, such as the wet rubfastness, the wet soak resistance and the wet flex resistance, are improved. The absolute and relative improvement, however, differs with the formulation. The optimum amount must therefore be suited to the type of polymer dispersions used in the finish. The chemical structure of a trifunctional aziridine cross linker is shown in Figure 3.

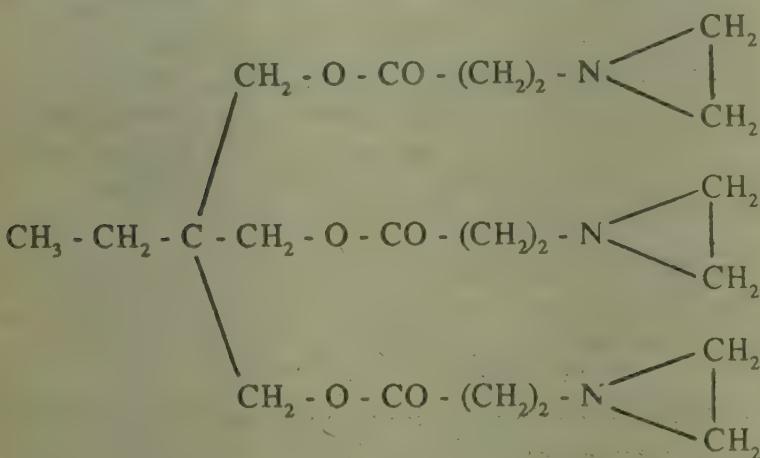


Fig. 3

Table 5

Influence of "Aziridine" cross linker on the physical properties of the finish

Top coat	A	B
Acrylic polymer dispersion	400 parts	400 parts
Ionomeric PU-dispersion	100 parts	100 parts
Water	500 parts	500 parts
Aziridine cross linker	-	15 parts
Physical properties		
Wat rub resistance	400	800
Wet soak resistance	150	250
Wet-flex resistance	20000	50000

Table 5 shows the improvement on physical properties achievable by the use of "Aziridine" cross linker. With this top coating formulation using a combination of finely divided acrylic polymer dispersion and ionomeric polyurethane dispersion and "Aziridine" cross linker, the overall water resistance of the finish film is appreciably improved. In addition to their effect on the water resistance the cross linking agents also have an influence on the other properties of the film. Particularly with acrylic dispersions the tensile strength of the cross-linked films, i.e. their toughness is improved. The butadiene binders are similar in their behaviour. Another beneficial effect of the cross-linking is the increased abrasion resistance and the reduction of the tackiness of the finish on

plating and piling. The use of cross-linking agents has thus the advantage that a high fastness level is achieved with a relatively thin finish film produced with polymer dispersions. This was mentioned earlier. Duroplastics are suitable film forming agents for top coats and possess good abrasion resistance. Unfortunately the selection of duroplastics usable for leather finishing is limited and so far only proteins, mainly in form of caseinates in solution or hydrosols have been found suitable for this purpose. Top coats based on casein have a number of beneficial properties. They are glazable and polishable, they impart to the finish good fastness to dry rubbing, improving the heat resistance and possess good resistance to organic solvents. Moreover, they impart to the leather surface feel (sensory) properties that comply with the current fashion trend, which favours a more natural appeal.

At first sight, it may appear that casein is unsuitable for water resistance finish film, because it is one of the most hydrophilic polymers. By fixation with formaldehyde, as is still practised nowadays, casein can be converted into a water resistance film. Owing to its high vapour pressure, formaldehyde is also found to be present in the air in more or less high concentrations. Formaldehyde has a strong irritating effect on the mucous membranes and its use is therefore problematic from the point of view of industrial hygiene. For this reason, the maximum allowable concentration in the finishing yard has been considerably reduced.

Research work directly aimed at solving this particular problem has led to the development of hardeners or fixing agents for casein in order to replace formaldehyde. A modified melamine compound was developed for the purpose. It is added directly to the finish formulations. Application in the form of a separate spray coat as in the case of fixing with formaldehyde, can therefore be omitted.

The toxicological data of this novel hardener are shown in the Table 6. According to this data this product does not call for any additional protective measures other than those normally taken in handling chemicals.

Table 6
Hardener for casein finishes

Solids content	: ca. 70%
pH value (diluted 1:10)	: 8-9
Acute oral toxicity LD ₅₀	: ca. 4,000 mg/kg on rats
Skin contact	: Not irritating on rabbits
(OECD-method 404)	
Mucous membrane contact	: Not irritating on eyes of rabbits
(OECD-method 405)	

Very good results have been achieved by this hardener when used in glazed finishes. The water resistance of the resultant finishes surpasses that of a glaze finish fix with

formaldehyde. These encouraging results led to the use of the new hardener also in resin finishes, where thermoplastics and duoplastics are used in combination, to achieve improved physical properties.

Summary:

It is possible nowadays to finish leather without using organic solvents. Regardless of the type of leather produced viz., upholstery, bag or shoe upper leather, water resistant base coats and a variety of top coats are possible. The emission of organic solvents can be reduced to a considerable degree by using new applications techniques, such as roll coating. The roll coating machine is emerging as a powerful tool in the forefront of finishing technology. Compared to spray application roll coating application leads to greatly reduced emissions and thus air pollution is kept to a minimum.

It has not yet been possible to meet all needs and demands called for by the quickly changing whims of fashion and solve all problems at once. Experience gained so far with the new waterborne finishing systems shows, however, that a high degree of flexibility which has been unknown before, has now been acquired although the end has not yet been reached. Research and Development work needs to continue.

Environmental protection is a challenge for each and

everybody living on this small globe. In order to cope with this challenge, one cannot afford to fail because future generations will be affected and have the right to live in a clean and healthy environment will be lost. Also the leather producing industry invited to make a contribution to reach that goal. Close interaction of three groups is necessary viz.:

- Engineers, who transfer the coating technique into machine technology
- Chemists, who prepare the needed products
- Finishers, who prepare the leather for the fashion conscious consumer.

General and fail recipes don't exist. The knowledge of the chemicals used and the knowledge of the conditions at the plant force each leather producer to search for his own optimum solution of the problems, with a view to environmental protection.

It is our conviction that Prof. B.M. Das — if he could live amongst us today — would agree with our statement:

- * "Let us continue to be producers"
- * There are many ways to produce good and beautiful leather
- * There are equally as many ways to do this without harming the environment
- * Creativity is in demand which has priority over protection".

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INDIAN LEATHER SCENE

Rs. 7.3 CRORE WORLD BANK LOAN FOR CLRI

The Central Leather Research Institute (CLRI), has been given a \$4 million (Rs. 7.3 crores) loan by the World Bank, to help modernise the leather industry in the country.

Given under the auspices of the Technical Support Services Programme (TSSP), the money will be specifically used to upgrade leather processing technology, improve footwear design and modernise the chemical and auxillary units.

An agreement to this effect was signed in Madras on Oct. 31 by CLRI and the Industrial Credit and Investment Corporation of India, distributors of the loan. Speaking on behalf of ICICI, Mr. A.T. Kusre, Chief of World Bank Division, pointed out that a total of \$ 55 million was available for disbursement under the TSS Program.

To improve the scheme's effectiveness, the amount has been broken into two components. A bulk of the funds (\$ 40 million) will be used to strengthen the R and D efforts of the technical institutes.

The balance \$ 15 million is to be given directly to the industry for sponsoring projects with the technical institutes.

A total of 10 to 15 institutes are to be supported under the scheme, he said. While CLRI is the first to qualify for such a loan, six others have also been identified for the purpose.

Among them the Bureau of Indian Standards and the Shri Ram Institute of Industrial Research will be immediate beneficiaries. In his opening address,

the CLRI Director, Dr. R.B. Mitra, said that the loan will be repayable in 15 years, including a four-year grace period, although the entire loan will be disbursed in a relatively short period of a couple of years.

He was confident of sticking to the repayment schedule given the level of interaction between the Institute and the industry. In fact, a separate monitoring committee, comprising almost entirely of representatives from the industry has been set up. Mr. M.M. Hashim, Chairman Council for Leather Exports, will head this committee.

Referring to the status of the Indian leather industry, the CLRI Deputy Director Dr. K.V. Raghavan, said that though the turnover had touched the Rs. 2,500 crore mark, the per capita turnover of many small tanneries is inadequate to support any individual R and D effort. Hence the need for a national institute like CLRI, to create infrastructural facilities.

Outlining the details of the soft loan, Mr. Raghavan said that it will be used to set up, among other things, a pilot scale continuous tanning unit, state of the art tanning facilities at CLRI to produce speciality leather, testing unit, computer colour matching facility, laser cutting facility for footwear patterns etc.

Launching the modernisation project, Mr. Hashim pledged the industry's full co-operation in the repayment process. Commending CLRI's role, he suggested that the technology developed here be sold to the neighbouring countries.

The local industry too must come forward to pay for the new technology instead of expecting to get a grant all

the time, he added.

PCP CONTROVERSY CLRI STRENGTHENING TESTING FACILITIES

Even as the country's leather industry is getting increasingly jittery over the raging "PCP controversy", the Central Leather Research Institute (CLRI) at Madras is gearing itself to meet the situation by strengthening research and testing facilities.

The German Government had recently banned import of Indian leather products tanned with pentachlorophenol (PCP) which is believed to cause cancer. Germany is the single largest overseas market for Indian leather goods.

Presently, the PCP testing facility at CLRI is limited to one equipment and this has obviously contributed to certain delay and backlog in sample tests. At the instance of the Commerce Ministry, CLRI has already placed orders for acquiring three more such equipment from Germany which will be installed in Madras, Calcutta and Kanpur.

According to Dr. V.S. Sundara Rao of CLRI, the International Union of Chemical Methods (IUC) under the Society of Leather Technologists and Chemists had met in Paris on September 17 to discuss the question of evolving a common procedure for testing pentachlorophenol. Apart from India, four other countries, namely, the UK, Italy, France and Germany, attended the meeting. The different procedures developed by these countries were evaluated at the meeting and it was found that the methods of CLRI and Freigerg Institute in Germany were almost similar. Right now, inter-laboratory tests are going on as yet another step towards finally

evolving a common procedure. In the meantime, CLRI is putting to use its method to help the industry and the addition of three more equipment from Germany where the procedure is identical will go a long way in clearing the backlog, Dr. Sundara Rao said.

Reacting to reports that the CLRI fee of Rs. 1,600 per sample is "exorbitant", he said in Germany the fee is anything between DM 380 and DM 400 which is almost triple the CLRI figure. Besides, the Institute's intention is to help the industry in its hour of crisis and not to make profits. What CLRI charges is only actuals and efforts will be made to bring down the fee, he informed.

Regarding alternatives to PCP, he said there have been many suggestions from Germany itself and some of these chemicals are available in the country. Here also, CLRI is extending testing facilities to ascertain the degree of PCP presence in these chemicals. CLRI is, however, cautious about one of the suggested alternatives, namely, trichlorphenol, which is again chlorine-based and hence toxic and could attract a ban at a later stage.

At a meeting in Bombay recently, CLRI has suggested to the Bureau of Indian Standards (BIS) to fix a standard for the tanning chemicals with nil PCP content. BIS had agreed to work in this direction and is expected to soon come out with the necessary norms, Dr. Sundara Rao said.

GERMANY REJECTS INDIAN LEATHER PRODUCTS

Germany is rejecting Indian leather products tanned with a banned antifungal chemical. It has recently become known that constant contact with leather products treated with pentachlorphenol (PCP) causes cancer.

The German Government banned PCP in December last. Recently it has started implementing the ban more

strictly. Leather product exporters say they find it difficult to control the use of PCP by leather tanners besides, there are few leather testing facilities in India. Moreover, they are "very time consuming and expensive". Efforts are being made by the Indo-German Export Project (IGEP), a programme jointly sponsored by the Government of India and Germany, and other agencies to provide better leather testing facilities.

Germany is the single largest market for Indian leather products. Leather product exports have grown from Rs. 70 crores in 1985-86 to more than Rs. 371 crores. PCP, which has been used in India for several years, is the cheapest chemical available for tanning. Chemicals such as dyes and fat liquors also contain PCP. It was first made by a foreign company to avoid fungus in wood.

Says Mr. Rohit Baluja, a spokesman of the Indian Chamber of Leather Industry", one can control the use of PCP, but how does one prevent its indirect use. He says tanners are not taking the ban seriously. The only Government recognised laboratory to test PCP was the Central Leather Research Institute at Madras. They take more than 45 days to test a leather sample at a high cost of Rs. 1,600 per sample, exporters says.

The delays are "ruining the exporters", leather manufacturers say. Mr. Baluja says the Government should immediately order a ban on the manufacture of PCP after identifying the factories making it. The IGEP is pleading with German firms to take a soft line and allow a few more months before rejecting the consignments.

According to Dr. D. Kebischull, Director of IGEP, six centres for testing PCP will soon be set up. Three will be set up by the Indian Government and two by the IGEP. Besides, IGEP is planning to bring two or three technicians from Germany to provide them training in testing leather tanned with PCP.

PANEL TO FINALISE WB LEATHER COMPLEX SCHEME

The West Bengal government has set up a committee to finalise a scheme of setting up an integrated leather complex in the state with World Bank assistance. The proposal, put forth nearly two years ago, has not progressed beyond the drawing board as the government could not decide on a location for the complex and persuade tanners to move out from the Tangra area in East Calcutta.

Leather goods manufacturers agreed to shift to a location on the southern fringe of the city but reportedly told the state administration that they would move only if their units were provided facilities for water treatment.

But, according to the state commerce and industries secretary, Mr. Bikram Sarkar, the entire industry has now agreed to move to a common location raising hopes the scheme can be implemented now.

Mr. Sarkar disclosed this at the annual general meeting of the Eastern Region Indian Leather Products Association (ILPA) in Calcutta on November 3. Mr. Sarkar said that the committee, to be headed by the WBIDC chairman, Mr. Salil Gupta, is expected to meet in the middle of this month to finalise the scheme. He said that the government is examining a few possible sites and a decision is expected to be taken shortly.

Mr. Sarkar emphasised the need for an integrated complex as it would help reduce pollution especially of the city's water system into which flows a large amount of toxic chemicals from the tanneries.

The commerce and industry secretary said that the state government would also set up a common effluent treatment plant within the complex, besides providing various infrastructural facilities.

These would include research and development facilities, a fashion and design centre, training centres, etc. He said that manufacturer-exporters would also be provided with all facilities to encourage exports from the complex. Talks are on with customs and excise authorities on the possibility of setting up a full-fledged office within the complex to take care of documentation problems of exporters.

Mr. R.K. Srivastava, chairman, ILPA welcomed the government's decision to set up the committee and hoped the proposal to set up the complex would be expedited. Later explaining the problems of the leather industry in the state, Mr. Srivastava said that the biggest setback to the export effort was lack of adequate availability of raw hides and skins. He said that of late there has been a sharp fall in raw material availability due to smuggling and ill-equipped slaughter houses in the eastern region. Besides, there is no sustained effort for carcass collection.

He renewed a proposal mooted by the Council of Leather Export to encourage the setting up mobile slaughter house facilities. Mr. Srivastava also hoped that limited import of raw material would be allowed to exporters to meet their commitments, which have been on the increase.

Exports of leather and leather products have crossed the Rs. 3,000 crore mark following a large demand for Indian products in the international market. He also urged the industry to step up modernisation efforts to meet the exacting demands of overseas buyers.

In his address, Mr. K.K. Dhandania, chairman, ILPA (ER), called upon the government to take appropriate measures to set up a network of modern mini carcasses recovery centres, encourage use of improved flaying tools and techniques and help set up modern slaughter houses. About 200 million

square feet of additional finished leather could be thus recovered by this.

Further, pointing out that the country was expected to face a deficit in supply of hides and skins aggregating 250 sq. ft. by the end of the 8th Plan necessitating imports, he said the country's resources must be fully utilised if exchange outgo is to be curbed.

He welcomed the Union government decision to phase out export of semi-finished and crust leather. Referring to problems facing the states based leather units, Mr. Dhandania urged the government to exempt the leather industry from the four per cent purchase tax. Mentioning that the majority of leather units in the state were in the cottage sector with low profitability margins, he said the levy was hindering the export effort. He also urged the state administration to take effective measures to curb hide smuggling as well as steps to encourage the footwear industry.

Pointing out that adequate stress had to be placed on manpower training, he welcomed the progress being made to set up a central footwear training centre at Budge Budge. On its part, ILPA (ER) has taken up a training programme for artisans.

Referring to Leathervision 1991, the annual buyer-seller meet organised by the association, Mr. Dhandania urged the state government to extend some concessions in renting out the facilities and space at the Netaji Indoor Stadium, so as to make the meet more effective. In reply, Dr. Sarkar said the state government has already decided favorably to this request.

LEATHER TANNING UNITS: LAND FOR COMMON EFFLUENT TREATMENT PLANT ACQUIRED

Land for the long pending common effluent treatment plant for leather tanning units in Pallavaram near Madras has been bought and the tenders for

work will be called soon. The Pallavaram Tanners Industrial Effluent Treatment Company Private Limited, which was set up in conjunction by about 65 small tanners for setting up and running common effluent treatment plant had been on the hunt for suitable land for the purpose since early 1989 when it was formed.

Although three locations were identified and one even acquired by the Tamil Nadu Pollution Control Board (TNPCB) each one was rejected or plans were foiled because of vested interests of some local groups, sources say.

These locations at Thirupanantazheri, and then Anakaputhur and later at Pozhichalur had been finalised by the Board, but plans were upset at the last moment each time by groups interested in getting payoffs from tanners, it is said. Now the TNPCB has bought 2.5 acres of land from a tanning company at the approximately cost of Rs. 10 lakh per acre and will be assisting the effluent treatment company to appoint a suitable project head and to tender for the works. Civil works are expected to start before the end of the financial year and the plant is likely to be commissioned by the end of 1991, board officials say.

The former proposals for the plant had to be modified to suit the new location. The earlier proposals for the plant have been modified to suit the new site and submitted to the Central Leather Research Institute (CLRI) Madras. CLRI's suggestions have been incorporated into the project, says a senior board official.

The effluent treatment plant is being put up with a capacity to treat upto 3,000 kilo litres of tannery effluent everyday. At present there is a daily effluent of 2,000 litres and the 50 per cent flexibility is being built in to provide for future capacity expansions of the existing tanning units.

The plant will cost Rs. 4.5 crores approximately, and about 10 to 15 per cent of this will be borne by the company. The Union government and the Tamil Nadu state government will be at 25 per cent each in the form of subsidy, the remaining 35 to 40 per cent can be financed through bank loans.

The TNPCB plans to locate an engineer in the premises of the effluent treatment plant to monitor the process and the standards of the treated effluents regularly. The plant itself will be put up under the overall supervision of the TNPCB officials. A similar common effluent treatment plant for small scale dyeing units is coming up in Kanchipuram. The Ammapet, Muthialpet Dyeing Effluent Treatment Plant Company which was formed to execute and run the plant has paid the advance for 4 acres of land for the purpose. This plant, to serve 60 member dyeing units in the area, is expected to be completed by December 1991.

RBI MOVE TO REDUCE LENDING: LEATHER UNITS APPREHENSIVE

Apprehension is spreading within the leather industry that there is a move by the Reserve Bank of India (RBI) to reduce bank lending to the leather industry, according to Mr. M.M. Hashim, chairman of the Council of Leather Exports (CLE). Mr. Hashim was speaking at the inaugural function of the training course in financial management for leather exporters at Madras on Oct. 31.

Saying that it was not clear whether such a move was specific to the leather industry alone — whether the RBI wanted to reduce its exposure to the particular industry — or whether it was thinking of reducing lending to all industries, he said that the leather industry was bound to suffer if this happened, specially since it was a high employment sector. Mr. B.L. Chadha, chief general manager, State Bank of India, Madras assured the industry that there

was no move to curtail credit, to the sector, and pointed out that it was in the interests of the industry to plough back some of the profits itself.

The SBI, he said, had set up a Rs. 2 crore fund for technical development and had just completed a study on the pumps industry in Coimbatore. It would be glad to undertake such a study on behalf of the leather industry too, he said. Mr. Hashim said that the industry was confident of reaching the revised target of Rs. 3,000 crores exports in the current year. The performance in the first six months, he said, has been encouraging with a 35 per cent growth. It was also encouraging that the trend was towards the export of finished goods like footwear and garments. 72 per cent of the exports so far, had been of value added leather products, he said and expected to finish the year with 75 per cent in that category the remaining in finished leather.

But the Indian leather industry still held only 2 per cent of the world's leather exports, he said. For improving our market share, the council for leather exports had identified three key areas to concentrate upon in the next five years. These were modernisation, higher unit value realisation and brand promotion. With these areas developed and streamlined, he said that the industry would be able to raise its exports from Rs. 4,000 crores to Rs. 5,000 crores in the next five years. But the turn of the century, they would be able to cross the Rs. 10,000 crore mark, he said.

TANNER'S PLEA TO SCRAP QUOTA SYSTEM

The Erode Small Tanners Association has appealed to the Commerce Ministry, to adopt a "non-quota" system for finished leather exports and to postpone the implementation of the quota system to be introduced from April 1991 "to the right time".

The association says that this is in line

with the government's policy of encouraging value added exports, which will generate more foreign exchange and employment. But the quota system proposed in this connection is not the right idea, as it serves to benefit "some particular section, whose suggestions have misguided the government's decision".

The problem with quotas is that it would lead to a "zamindari system", where only some units would have the right to export, while other units would be refused the right to export. This "unfair and unproductive regulation", the association felt would lead to unhealthy, competition-less domestic environment, fall in quality standards, and reduced unit value realisation of finished leather exports.

The association also felt that a better alternative would be the withdrawal of duty drawback or even levy of duty. This would automatically prevent the export of poor quality finished leather at lower unit value.

UNIDO TO HELP CONSTRUCT MODEL TANNERY

A UNIDO team has arrived in the Calcutta to make an in-depth study of the pollution problems in tanneries. Talking to reporters at Calcutta, Mr. Srdan Selanec, department manager of Project Rijeka and an expert on effluent treatment, said the team had already visited Madras and would be in West Bengal to consider ways and means of treating tannery effluents.

The UNIDO project, Mr. Selanec explained, covered eight countries in Asia — India, China, Bangladesh, Nepal, Indonesia, Sri Lanka, Pakistan and Thailand.

He said UNIDO would construct a model tannery effluent treatment plant in each country. The organisation would also help establish regional centres for pollution control. The total project cost is estimated at \$ 16 million.

NEW PRODUCTS

MACHUCADO WAX EFFECT

Stahl has recently introduced the wax fitters for producing the fashionable Machucado effect in which colour is deepened and enriched by the application of wax to give a distinct pull-up effect. The necessary waxiness is achieved by applying either EX-0558 or EX-0978 onto unfinished dyed crust leather when a natural darkening of the colour will take place. The best method of application is to use a 'heated' roller coating machine where a uniform coating is achieved which will develop its pull-up characteristics.

SPECIAL BLEND

Elf Aquitaine, the leading French industrial group has developed Stennic GLO, a special blend of sulphated fish oil and mineral hydrocarbon oil. Produced with economy in mind, it is recommended for industrial gloving leather, chrome tanned splits and corrected grain uppers. It also possesses good penetration power giving excellent softness.

Leather, 192, (4584), 1990.

AUTOMATIC DOSING SYSTEM FROM PAJUSCO TECHNOLOGIE

Tannery drums and paddles are Pajusco Technologie's principle products and to enhance this range they have recently developed automatic dosing systems for water and chemicals.

Today's drum manufacturers are increasingly becoming involved in the supply of technology as well as the vessels in which hides and skins are treated. Pajusco Technologie (PT) offer a full range of drums and paddles for processing from soaking and liming through to dry milling. Now these are becom-

ing more sophisticated with the addition of extras such as soft start mechanisms, liquor recycling, pH and temperature control, filtration systems for hairsave liming processes and the new Aquamat and Dosamat automatic dosing systems.

Through cooperation with Aquacontrol, a company working in the field of computerised and hydraulic systems and based close to PT, a complete system of drums with computerised process control has been developed. The Aquamat system consists of a control panel and a hydraulic group and it automatically blends and mixes water in the required quantities, and at the required temperatures, for distribution to the drums.

The precision of the plant is high ($+/-0.1^{\circ}\text{C}$ for in drum temperature and $+/-0.5\text{g}$ for liquid weight) and there are no limits for the selected temperatures. A maximum working temperature for each drum can be programmed and if this temperature is exceeded, feed to the drum is blocked and the system goes into a stand-by mode.

Programmed temperature

As well as having a maximum programmed temperature it is also possible to feed water at increasing temperatures for gradual warming, or at decreasing temperatures for cooling. The system is also self monitoring with a security thermometer directly read by the computer to ensure water is dosed at the correct temperature.

Dosamat is a fully computerised dosing plant capable of preparing mixtures of liquid and powder products for distribution to the drums. The system is quite versatile and can cope with mixtures consisting of up to 10 components, with a control capacity for automatic

dosing of 30 products per drum. The system is designed to control the production of up to 16 drums.

Where the quantity of product being dosed exceeds the capacity of the drum's feeding tank, the job is automatically divided into smaller lots. This is achieved by inputting the capacity of each drum's feeding tank into the computer and this capacity then becomes the maximum Dosamat capacity. The whole system can be interfaced with the warehouse for automatic stock control and re-ordering of chemicals.

The system can be operated at four levels:

- * Automatic remote — where all of the instructions to be executed are supplied by an external computer by means of serial talking.
- * Automatic local — where the basic data is keyed in by the drum operator and the process is then handled by Dosamat.
- * Manual — for complex process stages where the system is directed by the operator and the computer arranges to execute the instructions.
- * Emergency — the operations are completely entrusted to the operator.

Aquamat and Dosamat have been accepted quickly by tanners in Italy and 18 tanneries are already equipped with the system.

Controlled construction

The classical drum is the simplest machine used in the tannery and has changed little since its adoption. What has changed is the way that processing is controlled in the drum. Aquamat and Dosamat allow greater control and accuracy in processing and therefore provide savings. PT can also equip all of their

drums with features which today are regarded as standard equipment. Automatic doors and positioning, float recirculation, pH and temp. control and filtration systems are all part of the package.

Great care is taken in drum construction. The wood is very important and PT choose hardwoods such as Iroko, Azobe and Bubinga for their drums. Wood is carefully selected and before use it is sawn into planks and naturally seasoned for a minimum of 18 months in the open air before being conditioned in a special temperature and humidity controlled store room. Quality control is essential and all wood is thoroughly checked. Pieces with knots or cracks are trimmed or rejected before being put into work.

This meticulous selection system ensures that the wood used in construction will give the required properties of longevity, hardness, smoothness of grain and moisture retention.

Building a drum is a little like assembling a large, three dimensional jig-saw puzzle. Each piece is cut, planed and where necessary bent to its correct size. The drum is assembled in the factory to ensure that each piece is a perfect fit and is then dismantled for packing and ship-

ping.

The metal work is not overlooked and PT carry out their own milling work, in order to ensure that components are machined precisely. High grade and stainless steel are used to resist the corrosive environment of the tannery.

Another small success story for the company is the introduction of soft start mechanisms for drums. These dose the electricity to the drum motor at start up, reducing the amount of power consumed and prolonging the life of mechanical parts.

Along with quality, PT's aim is to meet the requirements of a changing industry. Dosamat and Aquamat are evidence of this but they have also been studying other areas, including the dry milling of leather.

Dust-free milling drum

Whilst PT are best known for their tanning drums and paddles they have recently developed a dry milling drum which controls the temperature, humidity and build up of dust inside the drum.

The creation of dust in dry milling is a serious problem and is not always easy to remove subsequently. The new PT drum uses static electricity to concen-

trate dust particles which are then 'sucked' out of the drum. The air is recirculated via a filter which removes the dust particles.

The air circulation system also allows the environment inside the drum to be maintained at pre-set levels. Where increased humidity is required water is sprayed into the air flow. The air is heated to, and maintained at, the pre-set temperature. Temperature and humidity values are set on the drum's control panel which gives a constant read-out of these values.

Leather, 192, (4554), 1990.

SERITOL FATLIQUORS

HQ Ledertec, the Spanish leather company have just developed a new fat liquor range, Seritol and a specific fat liquor, Glycermax SM-75. Glycermax SM-75 is a sulphated, high performance oil which ensures exceptionally well-balanced 'handle'.

The company defines 'handle' as quality specific to skins which have an excellent surface feel and they have isolated and quantified specific factors which give a skin thin quality. This fat liquor will enable the skins to retain their shape and have that special feeling too.

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LEATHER ABSTRACTS

Early detection of grain faults during wet processing. K.T.W. Alexander, M.P. Walker, R.M. Webster and A. Bugby, *J. Am. Leath. Chem. Assoc.*, 85, 191, 1990.

With the growing demand for high-quality full grain leathers and the necessity to minimise costs of reworking, the need for accurate and reliable sorting of semi-processed hide is becoming increasingly important. A wide range of high- and low-technology approaches has been investigated to determine whether they have any potential, to detect grain damage. This has led to the development of the 'sortassist' process based on a decolourisable pigment that effectively highlights grain faults on wet blue (75 to 85% detection rate) or pickled stock (on 95% detection rate). The pigment formulation can be applied either manually or by drum at pH ≥ 4 . After grain sorting, the pigment is decolourised and chemically destroyed by a short acid treatment step at pH < 3 prior to processing of the stock.

Comparative study of analytical methods for hexavalent chromium. C.L. Nazario and E.E. Menden. *J. Am. Leath. Chem. Assoc.*, 85, 212, 1990.

Determination of hexavalent chromium is essential for disposal of chromium containing waste into environment, but current methods produce ambiguity in reported results. Using fine concentration levels of Cr(III), determination of Cr(VI) were made using EPA solid waste methods, coprecipitation, colorimetric, diphenylcarbazide and chelation-extraction. The data indicate limitations in quantifying Cr(VI) in Cr(III) matrices. Chelation-extraction was able to show that one Cr(III) solution was free of any Cr(VI) contamination. For the other Cr(III) solution, the method indicated the presence of Cr(VI) but was unable to quantify the amount. Colorimetric analysis proved to be the most reliable, consistent and informative of all the three methods. It confirmed the findings of the chelation-extraction method, and in addition, quantified the amount of Cr(VI) present in the Cr(III) solution.

Environmentally friendly production of chrome tanned leathers. K.G. Dunhill, C.N. Jacktin and S.M. Grant, *J. Am. Leath. Chem. Assoc.*, 85, 225, 1990.

Environmental legislation threatens

chrome tanning as we know it today. This has led to the creation of the wet-white approach for leather production, using aldehydes, aluminium, titanium and zirconium salts. But the alternating to chrome does not offer the requisite stability or versatility. This paper suggests that chrome will remain the preferred tanning material and that every attempt must be made to make chrome tanning environmentally acceptable. Process for the retannage of most types of leathers are outlined, including high-exhaust chrome retanning systems.

The impact of aqueous polyurethanes on leather-finishing technology. F.A.P. Puller, *J. Am. Leath. Chem. Assoc.*, 85, 234, 1990.

This paper is a review of the recent history of polyurethane finishing followed by a description of recent improvements in such resins. Examples are given of typical formulations for the application of polyurethane finishes in achieving specific properties in the finished leather, with special consideration of their new importance as water-based components of leather finishing systems.

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International Market Update

DIFFICULT TIMES AHEAD FOR EUROPEAN FIBRE PRODUCERS

With prices of feedstocks zooming ever since the Gulf crisis, most European synthetic fibre producers have been hit hard, and most of them are contemplating increased prices of synthetics.

In the acrylics front, a 20% expected hike in fourth quarter contracts for acrylonitrile, a basic raw material, has meant that the acrylic industry would have to bear the greatest brunt of the oil shock.

Enimont (Italy), Courtaulds (UK) and Bayer (Germany) are expected to post increases. Current prices hover around DM 2.70/kg to DM 3.20/kg. in Western Europe.

Nylon producers are expected to be buffered for a few months, and are expected to announce hikes in early 1991, whereas polyester fibre producers, are likely to face raw material price increases with both MEG and PTA slated for substantial fourth quarter increases. This is expected to severely erode the reasonable margins existing in polyester staple fibre. Price hikes in polyester staple fibre are rendered difficult by stiff competition from producers in the Far East.

GOOD GROWTH SEEN FOR POLYPROPYLENE

A study by the Italian company, Feruzzi has revealed good growth in world-wide demand for polypropylene, looked upon by many as a modern-day barometer to measure industrial progress. As expected, the newly industrialised countries in the Far East, such as South Korea and Taiwan have shown good growths of 13% and 14% respectively.

Figures for other leading markets are

as below:

	% over 1989*
Italy	17.2
Germany	14.6
Taiwan	14.0
South Korea	13.0
U.S.A.	8.3
U.K.	6.9
France	5.3

* Consumption figures are compared for the period January-July, for 1990 and 1989.

SULPHUR IMPORTERS BADLY HIT BY GULF CRISIS

India is one amongst the many countries which have been seriously hit by sulphur shortages following the economic embargo on Iraq. Iraq, which exported some 250,000 m.t. of sulphur in the first four months of 1990, now finds itself out of the market, seriously disrupting supplies.

Bangladesh, Greece, Morocco, Pakistan, Romania, Tunisia and Yugoslavia, who have been sizeable customers of Iraqi sulphur, are now scrounging the markets for any material.

Saudi Arabia, which has not yet begun remelting its stocks could offer some relief. Spot prices ex-Al Jubail are now around \$105 per m.t., up by around \$10 since the invasion of Kuwait.

STYRENE MARKETS TIGHTEN IN U.S.

Increased demand from styrene manufacturers in the Far East, who have been badly hit by naphtha shortages, has led to a scramble to mop up available styrene and its precursor, ethylbenzene. This has also led to a serious shortage of chemical tankers. U.S. spot market prices for styrene are around 52-53 cents/lb and prices for ethyl benzene are around 34 cents/lb.

European contract prices are expected to be finalised shortly, but indications are of quotes in the region of DM 1,730 per m.t.

JAPANESE INTERMEDIATES IN THE U.S.

A new textile intermediates supplier Advanced Polymer (Saddle Brook, NJ) has been set up to market Japanese formulations in the U.S. The firm will market silicones from Shin-Etsu (Tokyo), fluorocarbons from Daikin Industries (Osaka), and special polyurethanes from Dainichiseika Color & Chemicals (Tokyo).

FERTILIZER OUTPUT SHOWS GAINS

U.S. production of nitrogen and phosphate fertilizer showed strong gains in August, according to The Fertilizer Institute (Washington). Potash output remained steady. Nitrogen production reached 994,000 tons, an increase of 16% from August 1989 and slightly down from July output. Nitrogen output for the fertilizer year to date climbed 13%, to more than 2 million tons. Phosphate output in August was up 7% over the year ago period, to 1 million tons while potash production was stable at 147,000 tons. Total shipments of nitrogen for the year through August increased 10%, to 2.08 million tons. Shipments of phosphate fell 6% in the same period, although U.S. and Canadian potash shipments rose 16%. Production of potash in Canada in August was up 27%, to 634,000 tons.

PLASTICS PRODUCTION STILL UP

Plastics production in the U.S. was still moving strongly ahead during July, according to the Society of the Plastics Industry (Washington). Total resin output for the month reached just over 4.4 billion lbs, a 9.1% increase from July 1989 and only marginally below June figures.

News About New Projects

PAKISTAN TO UP SODA ASH CAPACITY

Caravan Chemicals Ltd., Lahore is seeking tenders for the design, supply and construction of a \$30 million complex for manufacturing 43,000 m.t. of soda ash, 10,000 m.t. of caustic soda, 25,000 m.t. of ammonia, 45,000 m.t. of ammonium chloride, and 12,000 m.t. of calcium carbonate.

Pakistan has two soda ash producers operating presently -- Karachi based ICI, Pakistan (100,000 m.t./year being expanded by 135,000 m.t./year by end-1991), and Sindh Alkalies Ltd. (50,000 m.t./year, expanding to 100,000 m.t./year, end-1993). Growth in demand is good, with figures likely to reach the 250,000 tonne mark by 1995.

SHELL COMMENCES WORK ON NEW PET PROJECT

Shell Chemicals, will have major share-holding in a 60,000 m.t./year PET project to be located at Humberside, U.K. Zimmer (Frankfurt) will supply the technology for the project which is aimed for completion by end-1992.

Raw materials, terephthalic acid and ethylene glycol have not yet been tied up, but Shell says it will source both from within its companies and from the open market.

Enimont (Italy) is Europe's largest PET producer with 103,000 m.t./year capacity followed by ICI (London) with 72,000 m.t./year and Eastman Chemical (U.K.) with 50,000 m.t./year (expanding to 100,000 m.t./year).

JAPAN TO INCREASE CAPACITY OF SILICATES FOR DETERGENTS

Hoechst Japan has set up a joint venture with Tokuyama Soda for construc-

tion of a 20,000 m.t./year plant to manufacture sodium silicate, under the brand name SKS-6, at Tokuyama, Japan. In Japan, all detergents are phosphate-free and the trend is towards the use of alternatives like zeolites and silicates. Hoechst is also looking to European markets and is contemplating a 6,000 m.t./year facility in France.

DU PONT LYCRA FOR SINGAPORE

Du Pont (Wilmington, DE), is investing over \$100 million in a plant for Lycra spandex fiber in Singapore. Commercial production will begin in 1992. The unit will be centrally located in Asia Pacific to serve the region, including Australia and New Zealand, says Du Pont. It will have the capability of doubling in capacity to meet the needs of customers, according to Salim Ibrahim, worldwide business director Lycra. Du Pont's elastic fiber is used in women's hosiery, intimate apparel and swimwear. The Singapore plant will be the ninth site for Lycra. The other production plants are in the U.S., Canada, Northern Ireland, the Netherlands, Mexico, Brazil, Argentina and Japan. Du Pont recently announced another investment in Singapore for the production of adipic acid.

TiO₂ PLANT IN BRAZIL

Du Pont is construction a Ti-Pure titanium dioxide pigment sizing and packaging plant in Uberaba, Brazil. The Unit will begin operation in late-1991 to serve the Brazilian market. It is being built on a 235-acre site owned by Du Pont in the state of Minas Gerais. The company says it will build additional processing units to make the Uberaba facility a full scale titanium dioxide manufacturing plant by the mid-1990s. Du Pont is the world's largest producer of the white pigment with capacity for more than 700,000 m.t./year. It has pro-

duction plants in Edge Moor, DE, New Johnsonville, TN; Antioch, CA, De Lisle, MS; and Altamira, Mexico.

DU PONT AIRS NEW CFC REPLACEMENT

Du Pont has commissioned its first European plant for dimethyl ether (DME). The project to be constructed at subsidiary Conoco's (Houston) Humberside, U.K. facility, is Du Pont's first major chemical manufacturing unit on mainland U.K. Product -- marketed as Dymel A -- from the 15,000 m.t./year plant will be used as a partial replacement for fully halogenated chlorofluorocarbons (CFCs) in aerosols. DME has no ozone-depletion potential and a negligible impact on global warming. Dymel A will be marketed in Europe, the Middle East, and Africa. The company already has a similar capacity for DME at Belle, WV, in the US.

IRAN CONTRACTS EXPECTED SOON

At a time when many projects in the Gulf are on hold due to the political crisis in the Middle East, Iran is pushing ahead with three petrochemical complexes, at Arak, Tabriz, and Bandar Imam. The National Petrochemical Co. (NPC; Tehran) is in the final stages of discussion with contractors on two plants planned as the second phase of development at Arak. All but the ethylene oxide/glycol and oxo-alcohols units have already been awarded.

Three groups are competing for the 113,000 m.t./year ethylene oxide, 90,000 m.t./year monoethylene glycol, and 12,000 m.t./year diethylene glycol plants; TPL (Rome); Technimont (Milan)/Salzgitter Industriebau (Zalzgitter, West Germany); and Toyo Engineering (Tokyo). Scientific Design (Little Ferry, NJ) process has been selected. Davy McKee (London) is proposing its low pressure oxo-alcohols process for a 50,000 m.t./year complex, which will produce 2-ethyl hexanol and butanol.

International Technology Update

HOECHST ONE STEP FURTHER IN INSULIN PLANS

Hoechst has gone one step further in its moves to market a gene-spliced human insulin, with a German court overturning complaints against reinstatement of the group's permit to operate Phase-I and continue with Phase-II, of the three phase project.

The project involving production of human insulin from *E.Coli* ran into opposition from environmentalists who argued that the technique posed an environmental threat and endangered public health. Hoechst has promised to enforce strict controls on the fermentation and purification processes.

SOLAR POWERED EVAPORATION SYSTEM

Scientists at the University of Alabama, (Huntsville, USA) have developed a solar-powered system costing around \$1000 that can evaporate water from liquid wastes, sharply cutting disposal costs. The system requires no external power and pays for itself in less than a month considering the average disposal costs of around \$6 per gallon. The group is also planning a unit that will handle wastes containing volatile organic compounds, dissolved salts and solids.

CARBON CHEMISTRY AND ARCHITECTURE

Scientists at the University of Arizona (USA) and the Max Planck Institute for Nuclear Physics have synthesized pure C₆₀ and C₇₀ molecules and given it a name: Buckminster Fullerene, after the renowned architect, Buckminster Fuller. The molecules which are shaped like a football are expected to find a variety of applications, substituting diamond and graphite in many instances. Other applications are in the fields of cata-

lysis and lubrication.

NEW CHLORINE-FREE PROCESS FOR BLEACHING PULP

The Finnish Paper and Pulp Research Institute, has developed a new process for bleaching pulp which does away with chlorine. The process uses formic acid and hydrogen peroxide, in both the pulping and bleaching units. Kemira will build a pilot plant based on the process.

POLYMERS FOR MICROSTRUCTURES

BASF has launched a program to look into polymers which will be used for the next generation of electronic and mechanical devices which are expected to be a few micrometres thick. These polymers are expected to be not only sensitive to X-rays but also have good mechanical properties and dimensional stability under heat.

INCENTIVES FOR REDUCED FERTILISER USE

European farmers who agree to reduce fertiliser and pesticide usage over a five year period, will be eligible for financial incentives. The maximum compensation, to be dependent on the type of crop, has been decided.

Elsewhere in the U.K., a study by agricultural scientists has shown that cutting nitrogen-based fertiliser usage by 40%, herbicide usage by 28%, fungicide usage by 80%, and plant growth regulator use by 61% results in a general yield loss of only 0.8%.

The researchers are working on intensive farming methods to reduce agro-chemical, nutrient and energy inputs by 50%, while not reducing yields by more than 20%.

NEW BIOINSECTICIDE GETS EPA APPROVAL

A new bio-insecticide developed by Repligen Sandoz Research has been granted EPA approval for field tests. The bio-insecticide is based on a new genetically engineered strain of *Bacillus Thuringiensis (BT)*, and is claimed to be 2-3 times more potent in preventing crop damage by caterpillars than existing strains.

NEW HIGH-TEMPERATURE SUPERCONDUCTOR

Research scientists at Hitachi Corporation have developed a material that superconducts at 130°K, the highest temperature yet. The superconductor is made from strontium, and vanadium oxide. Hitachi has filed for patents for the composition. However Paul Chu, the Houston-based researcher, who initiated the race for high-temperature superconductors, has said that the results are irreproducible, and that work by his team on similar compounds had not given promising results.

REUSABLE POLYPROPYLENE

Matarah Industries will shortly introduce in the market a new "super absorbent" polypropylene fabric which is reusable too. Further, it is claimed that the fabric is 600% stronger as compared to the other fabrics in the line today.

Matasorb polypropylene is specially designed for high-tech spillage requirements on aqueous medium. The fabric also has industrial and construction applications. An improved lamination process allows it to be wrung out and reused without any loss of performance.

Tom Lutzow, Matarah's President opines that Matasorb's fine fibres can soak up 20 times their weight in oil and chemicals while staying afloat. Specific end-uses can be enlisted as follows:

1. Soaking up oil spills from aqueous medium;
2. Filtering off oily part in street construction;
3. Picking up oil that gathers around machines;
4. Restraining harmful liquids from getting mixed in landfills;
5. Preventing underground migration of polluting substances; and
6. Taking up spills in packaging during shipment.

JAPAN'S TECHNORA FIBRE

Teijin Ltd. of Japan claims that its *Technora* high tenacity aramid fibre exhibits one of the highest breaking strengths of all organic fibers. The organisation further claims it to be 8 times stronger than steel and 3 times stronger than glass or polyester fibres, of the same weight.

Further, it is claimed that *Technora* offers excellent impact, cut and abrasion resistance. A stiff, highly-oriented molecular structure enables it to keep creep stress relaxation low. Thermal shrinkage could not be detected upto a temperature of 392°F.

Suggested end-uses involve automotive (tyres, belts, hoses), industrial (ropes, cables, filters and canvas), protective coating (anti-ballistic, cut-resistant, anti-melting), asbestos replacement and cement reinforcement (floors, ceilings and pipes) and plastic reinforcement (aircraft equipment parts, printed circuit boards and electronic parts).

AMYLASE PRODUCTS

A new product Chem Zyme GC-2 X Special, said to be an ultra-high strength bacterial alpha amylase preparation in liquid form suitable for quick and effective digestion of starch normally encountered in textile processing has been announced by the Textile Products Division of Ivax Industries. The product is characterised by an unusually high

heat stability and excellent efficiency and is stable to selected detergents and solvents, report the manufacturers.

TWINSKIN

Twinskin is a new fully elastic textile with a Lycra base, designed for active sportswear. Thus another compilation has entered the market of high tech sports textiles as a result of a joint effort by Marcel Liebaert of Belgium and Du Pont de Nemours of France. It consists of three layers and the middle layer is an elastic film composed mostly of polyurethane 10 µm thick and in weight ranges from 10-15 g/m². Elastic Lycra forms the lining and is claimed to be specially designed to effectively remove sweat. The surface layer can be any elastic textile chosen from Liebaert's own range. This three ply construction is reported to give *Twiskin* several major advantages over high density or microporous induction textiles. It is fully elastic in all directions adapting to all body movements. Liebaert believes the construction makes the fabric more durable and abrasion-resistant than high density or micro-porous textiles. The fabric is guaranteed water-proof and wind-proof and is said to allow the skin to breathe and remove sweat from the body to the outside. This makes the fabric suitable for sports requiring wearer comfort combined with weather and wind protection such as cycling, motor-cycling, skiing, water sports and mountain sports. *Twinskin* can also be supplied in a variety of fashion colours. Liebaert, established in 1987, is one of the major European manufacturer of elastic textiles and produced five million square meters in 1989.

NEW FABRIC FROM COURTAULDS

Courtaulds Textiles, U.K., have launched a new subsidiary called Tarka, which is also the name of a new water-proof breathable fabric being launched by it.

The Tarka process can be applied to any type of fabric including cotton, polyester, nylon and elastomeric, and water-proof properties are imparted by coating, using a transfer process. A film of polyurethane is cast on a web of release paper and the fabric is subsequently applied to the film by an adhesive. The paper is peeled off and the fabric given an water-proofing finish.

Wearer trials have indicated no deterioration of properties even after usage for 8 months.

LIQUID COAL — FUEL FOR THOUGHT

The Japanese have shown a way out of the oil crisis by developing an alternate source of energy.

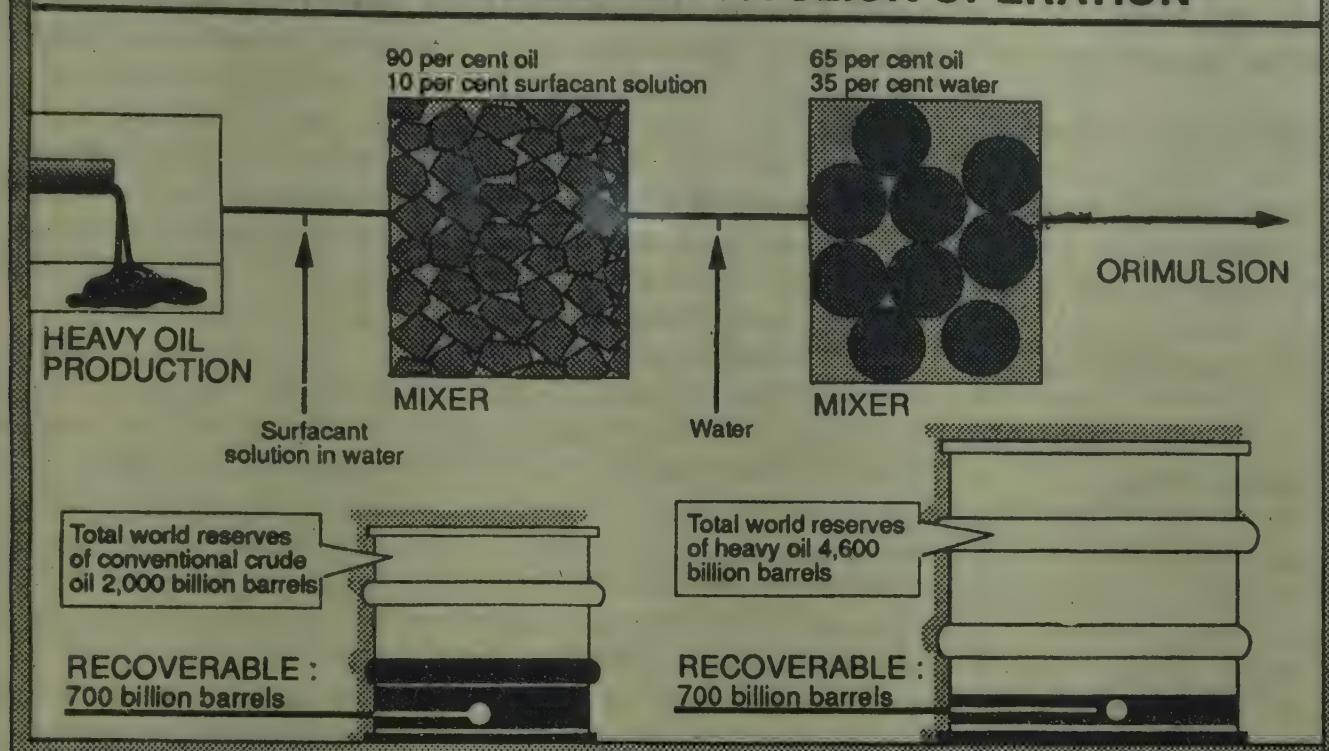
The Gulf crisis has sent tremors through industrialised countries which are heavily dependent on oil from the Middle East. Japan's economy, in particular, has come under scrutiny, from inside the country as much as from abroad. The result has been to help focus Japanese minds on the search for alternative sources of energy.

One development has provided particularly encouraging results. This is in combustion trials in Japan of an emulsified fuel oil, made using the sticky, black oil tar found in vast quantities in the Orinoco river basin of Venezuela.

As well as being an alternative source of energy, the new fuel, called Orimulsion, promises to have price advantages over crude oil. The Venezuelans are marketing Orimulsion as "liquid coal" and anchoring its price to the stable price of solid fuel. The price of crude oil, by comparison, is traditionally volatile, and has rocketed since the Gulf crisis began.

The development is particularly significant because around 50 per cent of the world's recoverable oil reserves are in these superheavy oils and bitumens.

EMULSION PRODUCTION : A SLICK OPERATION



found principally in Venezuela and Canada. Venezuela's recoverable reserves alone are said to be twice the size of Australia's coal reserves, equivalent to nearly 11 per cent of the world's known coal deposits.

The problem is that the tar's high viscosity makes transport and processing difficult and has limited its commercial application.

The initial breakthrough in broadening the use of the Venezuelan deposits, the world's largest, came with a patented two-stage mixing process invented jointly by British Petroleum (BP) and Petroleos de Venezuela (PDVSA), the Venezuelan oil company, in 1983. In the process, water is mixed with the treacle-like tar to produce a more manageable oil-in-water emulsion.

Since then, combustion trials of Orimulsion have been sponsored by Bitor, the PDVSA subsidiary set up to handle Orimulsion, at several power stations in Japan, Europe and North America.

The recently concluded Japanese tests were conducted jointly by Chubu Electric Power and Mitsubishi Heavy Indus-

tries, which is marketing Orimulsion in the Far East. They sought to evaluate the combustibility and handling properties of the fuel. The tests were conducted using a pilot plant which burned 4,500 metric tonnes of Orimulsion over a 4,000-hour operating period.

Masayoshi Arakawa, Manager of Mitsubishi's Orinoco Project department, says the results were so good that his company is now beginning to market Orimulsion to power companies and large industrial concerns, such as steel and textile manufacturers.

Although the fuel contains approximately 35 per cent water it is easy to burn, because the 10 micron diameter of the oil droplets burns more efficiently than the 200 micron droplets produced when pure oil is forced through a nozzle in the traditional oil burning power station.

Also, the Orimulsion only needs to be heated to a maximum of 60 degree C before it is fed into the burner, compared with 130 degree C for oil. These two savings offset the heat lost through the evaporation of the water. Set alongside coal, Orimulsion has a 9 per cent

higher heat content.

In addition, to checking the fuel's combustibility, the Japanese researchers studied the effectiveness of the flue gas treatment, needed to remove the relatively large amounts of sulphur and nitrogen present in the fuel. And they assessed the anticorrosive systems used to combat the high levels of vanadium and heavy metals inherent in Orimulsion.

The research team concluded that Orimulsion has the equivalent handling properties and combustibility of heavy oils. They also confirmed that magnesium added to the fuel helped reduce the high temperature corrosion of boiler tubes, caused by the presence of vanadium. However, they cautioned that in "super-critical boilers" (the high-temperature, high pressure boilers widely used in Japan) further measures would be necessary to reduce corrosion by sulphur.

The levels of sulphur produced from burning Orimulsion could prove the one Achilles heel of the fuel. Mike Sharkey, technical Manager of BP Bitor, which is marketing Orimulsion in Europe, says

the fuel has the same sulphur content as high sulphur-bearing mineral oils.

Whichever method companies choose to reduce sulphur is "purely a matter of economics", says Sharkey, who points out that the same sulphur reduction technology can be used for Orimulsion as is used for coal or oil.

Arakawa is also optimistic, "It is true an additional investment would be needed to revamp the sulphur extraction facilities of conventional oil-burning power plants but this would become a more attractive option with any rise in oil prices," he says.

Whatever the difficulties, commercial exploitation of Orimulsion is moving ahead in Japan. For a five-year period from mid-1991, the Kashima Kita power station, in central Japan will use 0.25 million tonnes of Orimulsion a year, and Mitsubishi's Kasei's plant, in Mizushima, plans to use 0.3 million tonne a year from late 1991.

There are equally ambitious plans in the UK, where Power-Gen's plant, in Cheshire, will burn 1 million tonne of Orimulsion a year from 1991, as part of a programme lasting several years, and its Richborough station, in Kent, is also conducting trials. The move is part of PowerGen's strategy to reduce its

dependence on coal by developing a portfolio of fuels, including natural gas and oil.

Unlike the Japanese marketers, PowerGen says that its tests have still to prove that Orimulsion could be economically and environmentally viable. Meanwhile National Power, the bigger of the UK's two power generating companies, is also examining the potential of Orimulsion. And in the US, Florida Power and Light is planning to burn Orimulsion later this year.

FDA TO BAN 111 INGREDIENTS

The U.S. Food and Drug Administration has proposed banning 111 ingredients frequently included in non-prescription weight-loss products.

The FDA said that one such ingredient, Guar Gum, "presents a safety hazard". The agency has received at least 17 reports of throat obstructions that developed after dieters swallowed tablets containing the substance. Ten of the obstructions required surgery. One man died later from a blood clot in the lung linked to the operation.

Guar Gum is a low calorie, high fiber substance. It absorbs water in the stomach and swells up to produce a feeling of satiety that allegedly discourages

further eating. The Guar Gum can absorb water in the throat and swell up there, however, potentially blocking breathing, FDA says.

Guar Gum is also contained in minute amounts in ice creams, cheeses and salad dressings, though it does not pose any safety hazard in those foods.

The other 110 ingredients the agency proposes banning in diet products present no safety hazard but they have not been shown effective in helping dieters lose weight, according to FDA. They include alcohol, corn syrup, dextrose, kelp, pineapple enzymes, saccharin, salt, vitamin C and wheat germ.

A panel of scientists found that these products had no significant impact on the success of dieting. The panel asked for further information from the manufacturers but "received no significant information".

FDA proposed that any non-diet product containing Guar Gum and other high-fiber substances as active ingredients include in their labels a warning that the product should be consumed with water. It is recommended that any one swallowing products containing Guar Gum drink an eight ounce glass of water immediately afterwards.

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MARKET INFORMATION

Caustic Up, Phthalic Eases

With arrivals of imported material, prices of phthalic anhydride in the Bombay chemicals market eased by Rs. 7 to Rs. 55/kg in the week under review. Caustic soda flakes and lye were up to Rs. 12.60 and Rs. 11.50 per kg following poor arrivals due to transport difficulty. Initial reports indi-

cate certain chemicals have been shifted from OGL to actual users category. A clearer picture is expected to emerge in the next few weeks. Rangolite firmed up to Rs. 8 per kg and Chinese quoted at Rs. 75 per kg. Prices of most intermediates ruled steady at their previous levels.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on November 20, 1990)

INDUSTRIAL CHEMICALS	Per Kg.				
Ammonium sulphate	2.50	Borax (Granular)	17.00	Cobalt oxide	550.00
Ammonium phosphate (Mono)	16.00	Borax (Powder)	24.00	Cresylic acid	62.00
Ammonium phosphate (Di)	16.00	Boric acid (Tech.)	45.00	Camphor (Indian)	107.00
Ammonium carbonate (Di)	17.00	Bisphenol-A	75.00	Cream of Tartar (Tech.) China	70.00
Ammonium bicarbonate	6.00	Butyl carbitol	106.00	Citric acid (Belgium) (Resale)	47.00
Ammonium chloride	4.00	Caustic soda (Flakes)	12.60	Citric acid (Indian) (Resale)	44.00
Ammonium nitrate	6.50	Caustic soda (Solid)	12.00	Copper sulphate	25.00
Arsenic white powder	22+ST	Caustic soda (Lye)	11.50	Chromic acid	70.00
Acrylamide (Resale)	82.00	Calcium chloride 70% (Solid)	3.25	Ethylene urea	65.00
Barium carbonate	18.00	Calcium chloride 75-80% (fused)	3.50	Ferric chloride (Lumps)	9.00
Bleaching powder (33% Cl)	5.00	Calcium chloride 36%	5.00	Ferric chloride (Anhydrous)	20.00
		(Anhydrous)	5.00	Glue flakes	15.00
		Calcium carbonate (precipitated)	6.00	Glue sheets	6.75
		Calcium carbonate (Activated)	5.75	Gohsenol GH-17	135.00
				Hydro	45.00



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Ahmedabad-380 014
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Hexamine (Resale)	37.00	(Flakes) (TCL)	Benzyl Chloride	34.00
Industrial Wax	25.00	Sodium sulphide pure (Flakes)	Benzo trichloride	16.00
Litharge	40.00	Sodium nitrite (Resale) per 50 kg.	Benzoyl chloride	22.00
Lead Acetate (Tech.)	39.00	1,300.00	Bromine Liquid	68.00
Lithopone	34.00	Sodium chlorite 80% (Spain)	Chloroform	30.00
Magnesium chloride (Crystal)	2.75	Soda Ash (Tata)	Carbon Tetrachloride	20.00
Menthol crystal (Flakes)	360+Ex+ST	Soda Ash (Birla)	Cellosolve	65.00
Menthol bold	425+Ex+ST	Soda Ash (Imp.)	Cyclohexanone	64.00
Menthol crystal cold	395+Ex+ST	Sodium bicarbonate	Cyclohexanol	58.+ST
Magnesium carbonate (Japan)	30.00	Sodium bisulphite	Diacetone (Resale)	26.75
Magnesium carbonate (Indian)	26.00	Sodium silicate	Diethyl Oxalate	34.00
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Potassium carbonate (Imported)	32.00	Urea (Tech.)	Dipentene	15.00
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Potassium phosphate (Mono)	34.00	Zinc Dust	Dimethylamine 50%	35.00
Potassium phosphate (Di)	25.00	Zinc Oxide	Ethyl Acetate	22.50
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Sodium sulphate (Coarse)	3.50	Butyl Acrylate	Melamine	60.00
Sodium sulphide 50-52% (Flakes)	11.50+ST	Butyl stearate	Methyl Ethyl Ketone	58.00
		Butanol	Methyl Isobutyl Ketone	42.00
			Methyl Acrylate	72.00
			Methylene Dichloride (Resale)	21.00

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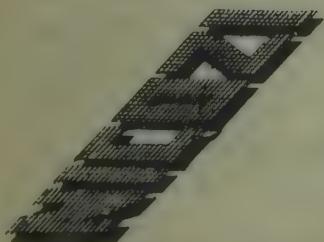
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Polyethylene Glycol (No.6000)	85.00		Para Cresidine (Imp.)	325.00
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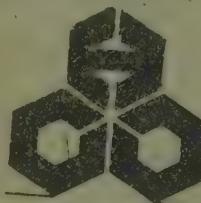
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306, Adamji Building, 3rd Floor, 413-Narshi Natha Street, Bombay 400 009.

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MULTI ORGANICS PRIVATE LIMITED

K-208, Keshava Bldg., 2nd Floor, Bandra-Kurla Commercial Complex,
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Phone Nos.: 6407778/6424736 Gram: MULTIORG, Bombay-51
Telex: 011-74530 MOL IN

Factory: A-1, MIDC Industrial Area, Chandrapur-442 401 (M.S.).

Phone: 7-54 Telex: 716-213 MORG-IN

Bombay Drugs Market

(Prices as on November 20, 1990)

Product	Rs./kg.	Product	Rs./kg.	Product	Rs./kg.
Acriflavine DPC	850.00	Disodium Hydrogen Citrate	43.00	Niacin	220.00
Aluminium Hydroxide IP	45.00	Ephedrine HCL	1850.00	Niacinamide	250.00
Ampicillin Trihydrate	1800.00	Erythromycin Estolate	2350.00	Nifedipine	1100.00
Aminophylline	350.00	Erythromycin Stearate	2100.00	Nitrofurazole	280.00
Albendazole	2100.00	Ethambutol IP	875.00	Oxyphenbutazone	775.00
Analgin	280.00	Ethophylline	650.00	Papaverine HCl	2000.00
Aspirin IP	90.00	Ferrous Fumarate	41.00	Paracetamol	200.00
Atenolol	2900.00	Folic Acid IP	3200.00	Pectin IP	425.00
Benzoic Acid IP	34.00	Furosemide IP	2200.00	Pepsin 1.3000	375.00
Bromine	67.00	Furazolidone IP	385.00	Phenbarbitone	510.00
Bromhexine HCL	2300	Guanidine Nitrate	40.00	Pheniramine Maleate	1250.00
Butylated Hydroxy Toluene	650.00	Gallic Acid	320.00	Phenyl Butazone USP	550.00
Caffeine Citrate IP	390.00	Haloperidone	19,000.00	Piperazine Citrate	95.00
Caffeine IP	400.00	Hematropine Methyl Bromide	12.00	Piperazine Hexahydrate	85.00
Calcium Gluconate IP	45.00	Hydrazine Hydrate	100.00	Potato Starch	65.00
Calcium Glycerophosphate	160.00	Ibuprofen IP	365.00	Propanolol HCL	1100.00
Calcium Lactate	40.00	Indomethazine	860.00	Pseudoephedrine HCL	2200.00
Calcium Phentonate	670.00	I.N.H.	270.00	Pyrazinamide	1225.00
Cetrimide IP	210.00	Inosite IP	900.00	Ranitidine	2800.00
Chlorbutol	95.00	Iodochloro Hydroxyquinoline	500.00	Rifampicin IP	3900.00
Chlorhexidine Gluconate 20% BP	225.00	Lactose IP	40.00	Saccharine Sodium	215.00
Chloroquin Phosphate	850.00	Lactic Acid	90.00	Salbutamol Sulphate	730.00
Chlorpromazine HCL	1500.00	Levamisole	1500.00	Sodium Iodide	425.00
Choline Chloride FG	35.00	Lignocaine HCl	350.00	Sodium Methoxide	105.00
Choline Chloride IP	58.00	Lignocaine Base	350.00	Sorbitol Powder	115.00
Cloxacillin Sodium	2200.00	L. Lysine Feed	95.00	Sorbitol USP	13.00
Cimetidine	2100.00	L. Lysine Pharma	300.00	Sulphacetamide	300.00
Citric Acid IP	45.00	Magnesium Hydroxide	30.00	Sulphamethoxazole	345.00
C.P. Maleate	1050.00	Magnesium Trisilicate IP	12.00	Tinidazole	375.00
Cyproheptadine Td	9500.00	Mannitol USP	102.00	Theophylline Anhydrous	370.00
Diazepam	800.00	Mebendazole	625.00	Thiacetazone	260.00
Dicyclomine Hcl	1500.00	Mercurochrome NF	280.00	Tolbutamide	200.00
Diethyl Carbamazine Citrate	300.00	Methyl Chloroformate	85.00	Trimethoprim IP	1050.00
Di-iodohydroxyquinoline	525.00	Metochlopramide TCL	2200.00	Vitamin A Palmitate	2600.00
Diloxanide Fumarate IP	575.00	Metronidazole IP	450.00	Vitamin B6 Hydrochloride	1450.00
Diphenhydramine HCL	260.00	Morpholine	115.00	Vitamin B2 5-Phosphate	4100.00

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Address:

Mahendra Mansion, 3rd Floor,
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BOMBAY - 400 002.

Phone:

31 16 19 (O)
672 68 57 (R)

Pharmica

Bombay Dyes Market

(Prices as on November 20, 1990)

ACID COLOURS	Per Kg.					Per Kg.
Acid Violet 4BS	*190.00	Brill. Fast Helio 2R	385.83	Red 2B		422.40
Acid Maroon V	110.00	Brill. Fast Helio 2RS	177.30	Red FB		425.80
Acid Orange II	112.55	Brill. Fast Helio BS	116.10	Red Violet FBL		622.00
Acid Orange IY	93.85	Brill. Violet Extra	181.45	Orange 3R		254.20
Acid Red A	137.00	Blue 2B	102.50	Violet 3R		370.50
Acid Scarlet 3R	128.35	Blue G	220.45	Violet RL		355.70
Acid Red 38N	*195.00	Sky Blue FB	242.00	Violet 6R		638.20
Acid Red R2R	132.00	Copper Blue GR	190.25	Scarlet RR		283.50
Acid Red RS	88.00	Fast Greenish Blue GL	114.60	Rubine 3B		289.10
Acid Patent Blue AS	*280.00	Developed Black BT	149.95	Rubine CB		449.50
Acid Green V	*375.00	Blue NB-2B	348.45	Blue GL		419.00
Acid Coomasi Blue	200.00	Blue NB-2BG	214.70	Blue BGF		805.80
Acid Yellow 5GN	65.00	Developed Black NB-GHB	214.70	Navy Blue RE		359.90
Acid Red PG	85.00	Green B	142.75	Brown 3REL		272.80
Acid Red GRS	78.00	Green NB-B	218.90	Black GEL		420.10
Acid Black 10 BX	157.15	Green 2B-N	218.90	Dark Brown 3B		411.10
Acid Black BX	126.95	Brown MR	197.40			
Acid Black Wax	135.50	Brown CN	137.00			
Crocein Scarlet MOO	200.30	Golden Brown G	175.85			
Procinil Yellow GS (ICI, UK)	265.00	Catechin G	155.70			
Procinil Red GS (ICI, UK)	530.00	Omega Tan	161.45			
Procinil Blue RS (ICI, UK)	315.00	Catechin GS	102.80			
Procinil Scarlet G (ICI, UK)	600.00	Black E Hly Conc.	180.15			
Procinil Orange G (ICI, UK)	250.00	Black E Extra Hly. Conc.	180.15			
Procinil Rubine (ICI, UK)	550.00	Black NB-ER Hly. Conc.	290.50			
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DIRECT COLOURS	Per Kg.	DISPERSOL COLOURS	Per Kg.	BASE COLOURS	Per Kg.	
Yellow 3GX	114.00	Red B 3B Conc.	611.50	Fast Yellow GC	77.75	
Gun Yellow RCH	175.85	Red B 2B Conc.	797.90	Fast Orange GC	128.40	
Fast Yellow GCH	171.50	Red CB Powder	1048.25	Fast Scarlet R	198.05	
Yellow CFG Hly. Conc.	721.00	Red D2B Powder	580.65	Fast Scarlet RC	128.40	
Fast Yellow GS	126.96	Violet C 4R	1202.70	Fast Scarlet RCR	105.60	
Fast Yellow CHRS	116.85	Blue BG Powder	580.65	Fast Scarlet G	115.75	
Viscose Orange A	210.35	Blue BN Powder	128.25	Fast Scarlet GN	92.95	
Fast Orange GR	171.50	Blue D' 2R Powder	588.25	Fast Scarlet GG	77.75	
Red	122.65	Navy BT Conc.	531.95	Fast Scarlet GGS	73.95	
Dark Tan	98.15	Blue B 2G Conc.	577.95	Fast Red B	233.50	
Red IIR	98.15	Blue BT Conc.	319.50	Fast Red RC	115.75	
Red 4B	217.55	Blue BR	482.40	Fast Red R Flakes	158.80	
Bordeaux BW	170.10	Yellow 7GL	813.20	Fast Red TR	181.60	
Fast Scarlet 4BS	223.50	Yellow 5RX	269.90	Fast Red TR Oil	223.35	
Red 12B	220.45	Yellow 3G	473.20	Fast Red RL	251.20	
Bordeaux Hly. Conc.	249.20	Yellow	140.00	Fast Red KB Oil	251.20	
Cotton Red N	117.05	Yellow AL	167.20	Fast Bordeaux GP	236.00	
Brill. Fast Helio B	362.85	Yellow Brown REL	311.70	Fast Garnet GBC	103.05	
		Yellow FFL	571.40	Fast Violet B	548.80	
		Gold Yellow GG	320.80	Fast Blue BB	566.50	
		Pink REL	593.00			
		Red BEL	615.60			
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NAPHTHOL COLOURS	Per Kg.					
ASG	301.85					
AS	205.65					
ASSW	379.10					
ASBS	253.75					
ASBO	266.40					
ASD	209.45					
ASOL	243.60					

* To get resale price add 6% tax.

ASTR	369.00	Blue H-FRD	305.80	Brill. Purple 2R Hly. Conc.	744.25
ASPH	336.05	Navy Blue H ER	333.75	Brill. Purple 4R Supra Disp.	604.25
ASE	236.00	Blue H 5RX	286.20	Brill. Purple 2R Acra Conc.	779.85
ASEL	249.95	Navy Blue M 3R	355.70	Blue 2R Pdr. Fine	675.30
ASLB	2,002.35	Brill. Blue MR	405.60	Blue BC Acra Conc. Pdr. Fine	1013.15
ASBT	2,459.45	Brill. Blue M RX	214.20	Blue BC Conc. Pdr. Fine	713.65
ASWG	143.00	Brill. Blue M-G	226.45	Blue R Conc. Pdr. Fine	719.70
ASSG	538.65	Blue M 4GD	369.40	Blue Conc. Powder	645.80
ASSR	652.60	Navy Blue M RR	341.85	Brill. Blue 2R Hly. Conc.	378.55
		Turquoise M-G	240.30	Blue RR Supra Powder	629.35
		Brill. Blue M GX	516.25	Brill. Blue 2R Supra Disp.	115.65
PROCION COLOURS		Per Kg.	Blue 3R Acra Powder	718.20	Dark Blue 2R Powder Fine
			Dark Brown H 6R	248.45	Blue BC Supra Disp.
Golden Yellow HR	207.95	Cobalt Oxide	285.00	Jade Green XBN Powder Fine	555.80
Brill. Yellow H4G	145.65	Green H 4BD	287.00	Jade Green XBN Acra	
Supra Yellow H-8GP	168.55	Green H-E4BI	169.80	Conc. Pdr.	1026.05
Brill. Yellow HE6G	214.75	Red Brown H IF	143.25	Jade Green 2G Pdr. Fine	533.25
Yellow G-E4R	276.05	Orange Brown H 28	209.05	Jade Green 2G Ptg. Paste	125.40
Brill. Yellow H7G	332.30	Brown M GRN	188.80	Jade Green XBN Ptg. Paste	126.00
Yellow M4R	275.45	Black H-N	314.20	Jade Green 2G Supra Disp.	618.00
Yellow M GR	387.65			Olive D Pdr. Fine	563.90
Brill. Yellow M4G	201.15			Olive Green B Supra Disp.	421.70
Brill. Yellow M8G	366.10	SULPHUR COLOURS	Per Kg.	Jade Green XBN Supra Disp. (N)	327.30
Yellow M 3R	244.70			Olive OMW Pdr. Fine	698.55
Brill. Orange H 2R	303.80	Navy Blue	210.35	Olive OMW Supra Disp.	538.05
Brill. Red H 7B	157.95	Green G	194.55	Olive D Supra Disp.	361.70
Brill. Orange M 2R	313.15	Black Grains Extra	72.25	Olive R Supra Disp.	470.25
Brill. Red H 8B	213.55	Black Grains OG	73.70	Olive D Ptg. Paste	193.00
Brill. Scarlet H RN	245.05	Black GXE Conc.	70.85	Olive Green B Ptg. Paste	199.10
Supra Red H-3BP	179.80	Black GXE	57.90	Olive Green B Acra Conc.	741.10
Brill. Red H-F3B	243.45	Black GXR	69.40	Olive R Acra Conc.	779.85
Brill. Magenta HB	182.00	Black Grains 800	62.80	Brown R Pdr. Fine	869.45
Brill. Red M 5B	160.05	Black EXR Grains	73.70	Dark Brown 3R Fine	826.25
Brill. Red M 8B	218.35	Black EXR Grains 800	59.35	Brown G Supra Disp.	582.05
Brill. Pink MB	137.10			Brown 2G Supra Disp.	716.10
Brill. Magenta MB	163.65			Brown R Supra Disp.	547.35
Brill. Purple H-3R	219.55	VAT COLOURS (ICI)	Per Kg.	Brown BR Powder	867.75
Brill. Purple H-7R	175.40			Dark Brown 3R Ptg. Paste	217.15
Navy Blue H 3R	333.75	Yellow 5G Supra Disperse	561.85	Dark Brown 3R Supra Disp.	529.60
Brill. Blue H-GR	406.40	Yellow 5G Acra Con.	818.60	Brown G Acra Conc.	967.95
Brill. Blue H 5G	207.95	Gold Orange 3G Pdr. Fine	1158.45	Brown M. Powder Fine	768.80
Blue H 5RX	286.20	Brill. Orange 6R Pdr. Fine	624.35	Grey M. Supra Disp.	585.45
Brill. Blue H 7G	213.95	Gold Orange 3G Supra Disp.	693.85	Blue BC Acra Conc. Pdr. Fine	762.70
Brill. Blue H 7RX	358.15	Brill. Orange 6RX Powder	394.30	Direct Black AC Supra Disp.	415.75
Turquoise HA	265.05	Brill. Red 3B Pdr. Fine	1214.15	Direct Black AC Pdr. Fine	574.70
Supra Blue H-3RP	595.30	Brill. Red 3B Supra Disp.	867.45	Direct Black CH Supra Disp	490.45
Supra Turquoise H 2G P	181.50	Brill. Purple 3R Acra Powder	827.05	Direct ACD Ptg. Paste	211.15

Delhi Market

DELHI: NOVEMBER 16: NNS
 Boric acid technical suffered a setback of Rs. 200 at Rs. 2,300 per 50 kg in the Delhi chemicals market on Nov. 16, on account of withdrawal of buying support by local and outside consumers. In view of improved supply and absence of demand from bakeries, ammonia bicarb slipped by Rs. 15 at Rs. 165 per 25 kg. In the first week of October, ammonia bicarb was quoted higher at Rs. 250. As a result of increased supply by the manufacturers, camphor powder dropped by Rs. 8 at Rs. 102. Chatkolite slipped by Re. 1 at Rs. 65 due to poor enquiries. Caustic soda flakes reacted downward by Rs. 5 at Rs. 555 in view of better stock, whereas soda ash recorded a rise of Rs. 10 at Rs. 375/385 in view of increased demand.

Following fall in arrivals from Sambhal, Moradabad, Rampur, Amroha, Chandausi and Barabanki areas of U.P. combined with good demand from local consumers, menthol medium and bold shot up by Rs. 10/15 at Rs. 295 and Rs. 310. Menthol flake also followed suit and rose from Rs. 268 to Rs. 272. DMO and

mentha oil moved up by Rs. 3/5 at Rs. 78 and Rs. 185 in the absence of selling pressure. In the absence of demand from traders, sodium hydro-sulphite Kalali, Gulshan and Tamil Nadu ruled quiet at Rs. 50, Rs. 45 and Rs. 46 per kg respectively.

Stock of sufolite declined from 70 tonnes to 35-40 tonnes in Delhi during last few days, coupled with spurt in demand by gur and khand-sari manufacturers, its prices jumped up by Rs. 2.50 at Rs. 72.50. Due to fall in import from Germany, rango-lite Germany spurted by Rs. 5 at Rs. 105. As a result of dwindling supply and tight stock, residue and match wax registered a marked rise of Rs. 600/1,000 at Rs. 5,500 and Rs. 21,000 per tonne. Similarly slack wax advanced by Rs. 100 at Rs. 12,000 per tonne. Paraffin wax remained firm at Rs. 1,200 per 50 kg, whereas acetic acid quoted higher by 50 paise at Rs. 17 per kg due to poor inflow. Hydrogen peroxide, on the other hand, receded by Re. 1 at Rs. 33/35 per kg in view of better supply. Prices of other chemicals remained unchanged at their last week level.

Menthol Flake (Per Kg.)	272.00
Mentha Oil (Per Kg.)	185.00
Glycerine (Per Kg.)	53/56.00
Sodium Silicate (Per quintal)	300/400.00
Hexamine (Per Kg.)	34.00
Acetic Acid Glacial (Per Kg.)	17.00
Copper Sulphate (Per quintal)	2,400/2,600
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	33/35.00
Calcium Carbonate (Per Tonne)	2,800/5,800
Acid Slurry Soft (Per Kg.)	42.00
Acid Slurry Hard (Per Kg.)	35.00
Phosphoric Acid (Per 50 Kg.)	1,400.00
Potassium Nitrate (Per quintal)	1,000/1,250.00
Potassium Permanganate (Per 50 Kg.)	2,600/3,000.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	710.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	63.00
Titanium Dioxide RC-822 (Per Kg.)	85.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	59.00
Titanium Dioxide RCR-2 (Per Kg.)	90.00
Zinc Oxide (Per Kg.)	46.00/50.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	24.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	4,300/4,600.00
Naphthalene Balls (Per 50 Kg.)	1,500.00
Match Wax	21,000.00
Residue Wax	5,500.00

DYES & COLOURS (Per Kg.)

Naphthol AS	175/211.50
Naphthol ASG	180/249.70
Naphthol ASBS	210/260.75
Naphthol ASTR	300/378.92
Naphthol ASOL	210/250.90
Naphthol ASBO	195/274.30

DIRECT DYES (Per Kg.)

Black E. Conc.	120/185.30
Diazo Black B.T.	105/154.50
Green B	90/147.55
Blue 2-B	60/107.00
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/248.20
Basic Auramine	55/110.00
Basic Rhodamine	315/425.00
Basic Methylene Blue	100/180.00
Basic Violet	165/210.00
Basic Malachite Green	185.00
Acid Orange	75/111.20
Congo Red H/C	85/120.95

(DELHI MARKET RATES AS ON NOVEMBER 16, 1990)

Ammonia Bicarb (Per 25 Kg.)	165.00	Tartaric acid France (Per Kg.)	314.00
Mercury (Per flask)	10,700.00	Sufolite (Per Kg.)	72.50
Soda ash (Per bag)	375/385.00	Chatkolite (Per Kg.)	65.00
Ammonium Chloride (50 Kg.)	140/180.00	DMO (per Kg.)	78.00
Caustic soda flakes (50 Kg.)	555.00	Boric acid Technical (Per 50 Kg.)	2,300.00
Citric acid (Per 50 Kg.)	2,200/2,450.00	Paraffin Wax (Per 50 Kg.)	1,200.00
Stable Bleaching Powder		Slack wax (Per metric tonne)	12,000.00
Shriram (Per 25 Kg.)	101.00	Tartaric Acid (France Per Kg.)	314.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00	Tartaric Acid (Swastik Per Kg.)	210.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	91.00	Borax Granular (Per 50 Kg.)	1,000.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00	Borax Crystal (Per 50 Kg.)	1,000.00
Sodium Bicarbonate (50 Kg.)	325/350.00	Sodium Nitrite (Per 50 Kg.)	1,050/1,200.00
Sodium Hydrosulphite (Per Kg.)	45/50.00	Sodium Nitrate (Per 50 Kg.)	520.00
Rangolite (Per Kg.)	105.00	Camphor Thal (Per Kg.)	115.00
		Camphor Powder (Per Kg.)	102.00
		Menthol Bold (Per Kg.)	295.00
		Menthol Medium (Per Kg.)	272.00

Madras Market

Markets have been brisk for some time. There have been good enquiries for sodium silicofluoride and the price quoted is Rs. 8 per kg. MEK ruled high due to poor indigenous production on account of raw material problem. It is expected that the production will pick up in about a week's time when adequate feed-

stock will be flowing. Prices of other solvents remained at previous levels.

DEG had good enquiries from leather and textile processing units. Acid slurry prices were up by Rs. 4 due to price increase of linear alkyl benzene, the price of which has gone up by Rs. 3/kg over the week.

(MADRAS MARKET RATES AS ON NOVEMBER 17, 1990)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate Iron free (per MT)	4,250.00
Ammonium Bicarbonate (per 25 kgs)	165.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	35.00
Barium Carbonate (per kg)	11.00
Barium Chloride (per kg)	10.00
Boric Acid Technical (per kg)	28.00
Bleaching Powder (per 50 kgs)	225.00
Borax (per 50 kgs)	825.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	11,400.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,400.00
Calcium Chloride 70% Solid (per MT)	3,500.00
Calcium Chloride Anhydrous (per MT)	6,500.00
Calcium Carbonate (Activated) (per MT)	6,750.00
Calcium Carbonate (Precipitated) (per MT)	5,750.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	25.00
Cresylic Acid 98-99% (per kg)	140.00
Pure Para Cresol 96% (per kg)	105.00
Meta Para Cresol 42% (per kg)	54.00
Formic Acid (per kg)	27.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	49.00
Hydrosulphite of Soda (TCPL) (per kg)	42.00
Hydrosulphite of Soda (IDI) (per kg)	45.00

Hydrosulphite of Soda (BASF) (per kg)	48.00
Hexamine (per kg)	35.00
Hyflosupercell (per kg)	26.00
Hydrogen Peroxide (per kg)	38.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	17.00
Magnesium Chloride (per kg)	4.10
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	345.00
Oxalic Acid (per kg)	17.00
Paraffin Wax (per kg)	24.00
Potassium Bichromate (per kg)	38.00
Phosphoric Acid (per kg)	32.00
Polyvinyl Alcohol Powder (per kg)	160.00
Pentaerythritol (per kg)	54.00
Phthalic Anhydride (per kg)	55.00
Soda Ash (TAC) (per 75 kgs)	420.00
Soda Ash (TATA) (per 75 kgs)	420.00
Sodium Bicarbonate (TATA) (per 50 kgs)	400.00
Sodium Silicate (per MT)	4,500.00
Sodium Bichromate (per kg)	34.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	20.00
Sodium Sulphide Flakes (per kg)	20.00
Sodium Bisulphite (per kg)	8.00
Sodium Alginate (per kg)	350.00
Sodium Acetate (per kg)	8.00
Sodium Sulphate (Anhydrous) (per kg)	4.20
Titanium Dioxide (Anatase) (per kg)	65.00
Titanium Dioxide (Rutile) (per kg)	85.00
Trisodium Phosphate (per kg)	10.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00

CALCUTTA MARKET (Prices as on Nov. 18, 1990)	
Acetic acid (per 50 kg)	750.00
Basic chrome sulphate (per 50 kg)	800.00
Benzene (litre)	11.50
Bleaching powder (bag)	240.00
Borax granular (per 50 kg)	810.00
Boric acid (per 50 kg)	1,625.00
Camphor (per kg)	102.00
Caustic soda lye (per ton)	NA
Caustic soda flakes (per 50 kg)	555.00
Glycerine (per kg)	53.50
Menthol bold (per kg)	570.00
Menthol medium (per kg)	380.00
Menthol small (per kg)	300.00
Phosphoric acid (per 50 kg)	850.00
Phenol (per 50 kg)	1,550.00
Soda ash (75 kg)	295.00
Sodium bichromate (per 50 kg)	1,150.00
Sodium bicarbonate (per 50 kg)	285.00
Sodium nitrate (per 50 kg)	380.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	1,600.00
Trisodium phosphate (per 50 kg)	390.00
Toluene (litre)	12.50
Zinc Chloride Powder (per kg)	14.00
Zinc Sulphate (per kg)	10.00

SOLVENTS

Acetone -- HOCL (per kg)	25.00
Butanol (per kg)	38.00
Butyl Acetate (per kg)	39.00
Benzene (per lit)	17.00
Cellosolve (per kg)	70.00
Carbon Tetra Chloride (per kg)	22.00
Chloroform (per kg)	29.00
Diacetone Alcohol (per kg)	34.00
Diethylene Glycol (per kg)	40.00
Dichloroethane (per kg)	20.00
Di-octyl Phthalate (per kg)	65.00
Di-N-butyl Phthalate (per kg)	65.00
Ethyl Acetate (per kg)	25.00
Isopropyl Alcohol (per kg)	34.00
Methanol (per kg)	12.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	50.00
Methyl Isobutyl Ketone (per kg)	46.00
Phenol (per kg)	48.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	98.00
Trichloroethylene (per kg)	26.50
1-1-1 Trichloroethane (per kg)	29.00
Turpentine (per lit)	16.00
Toluene (per lit)	18.00
Xylene (per lit)	30.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
21/11	Ever Bridge (V-042) (Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & All Destinations in U.K.; Germany; Switzerland and Austria. (Carting at G/H Cotton Depot).	28/11
26/11	Anika Oltmann (Ger)	Samrat/ Hindustan/ Killick/ L. Triest	Felixstowe; Hamburg; Rotterdam; Also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Bremen; Amsterdam; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Helsinki; Stockholm; Belfast & all destinations in U.K.; Benelux; Germany; France; Switzerland; & Austria; Barcelona; Marseilles; La Spezia; Livorno (Leghorn); Genoa; and other Italian ports and FCL only Beirut; Alexandria; Valletta; Limmasol; Larnaca; Lattakia; Mersin; Izmir. (Carting at M.O.D. No. 1 for Samrat & Hindustan). Felixstowe; Rotterdam; Hamburg; Antwerp; Le Havre; Lisbon; Leixoes; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Bremen; Bremerhaven; Aarhus; Copenhagen; Gothenburg; Helsingborg; Oslo; Helsinki; Alexandria; Lattakia; Mersin; Malta; Limmassol; Piraeus. (Carting at E-Shed Grain Depot). Felixstowe & U.K.; Inland destinations; Hamburg; Rotterdam; and inland destinations in Cont; Genoa; Leghorn; La Spezia; Naples with TP Las Palmas; Santacruz de Teneriffe; Malta; Limmassol; Alexandria; Tunis; Benghazi. (Carting at M-171-173 Cotton Depot).	1/12
3/12	Tibor Szamuely (Rus) (V-113 W/B)	Transocean	Odessa; Izmail; Reni (U.S.S.R.); Russe; Bulgaria; Budapest (Hungary); Linz; Vienna (Austria); Bratislava (Czechoslovakia); Deggendorff; Regensburg (West Germany). (All Ports on River Danube). (Carting at N/O-PD & G-PD).	4/12
4/12	Rhine Forest	M.S.P.L.	Assab; P. Suez; (Alexandria). (Carting at P/Q-PD).	5/12
22/11	Orange	Marcons	Karachi (Afghanistan)	28/11
19/11	Pakov (Rus)	Transocean	Singapore; Main Japan Ports.	30/11
21/11	Ever Bridge (V-042) (Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at G/H Cotton Depot).	28/11
24/11	Ocean Strength (V-28A/B) (Lib)	O.S.A./ M.S.P.L.	P. Kelang; Singapore; Kaohsiung; Honkong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Shimizu; Keelung; Tsingtao; Quindao; Xiangang; Shanghai. (Carting at B. Pier Extn.) Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Kaohsiung; Busan. (Carting at E-Shed Grain Depot).	4/12
29/11	S/o. Nagaland (Ind)	S.C.I.	Main Japan Ports; Busan (Taiwan).	10/12
4/12	Rhine Forest	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	5/12
24/11	Ocean Strength	O.S.A.	Sydney; Melbourne; Adelaide; Brisbane; Fremantle; Auckland; Wellington; Lyttelton; P. Chalmers. (Carting at B. Pier Extn.).	4/12
23/11	Harmony Stove	Prudential	Doha	1/12
24/11	Bravo Sif	Penguin/ O.S.A./ Parekh/ Seaspeed	Dubai; Abu Dhabi; Sharjah; Doha; Muscat; Jebel Ali; Bahrain. (Carting at H.B. No. 4). Dubai; Doha. (Carting at B. Pier Extn.) Muscat; Dubai; Sharjah. (Carting at Timber Pond No. 3).	28/11
21/11	Ever Bridge (V-042)	Greenways	Dubai; Dammam; Bahrain; Doha. (Carting at M-178 Cotton Depot). New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Alameda; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas;	28/11

(1)	(2)	(3)	(4)	(5)
			Various inland destinations & Caribbean Ports. (Carting at G/H Cotton Depot).	
24/11	Ocean Strength (V-28A/B)	O.S.A.	New York; Baltimore; Philadelphia; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma & S. American & West Indies Ports. (Carting at B. Pier Extn.).	4/12
26/11	Anika Oltmann	Samrat/ Hindustan/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; P. Lauderdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto & S. American Ports. (Carting at M.O.D. No. 1 for Samrat & Hindustan) (Carting at M-171/173 for L. Triest).	1/12
3/12	Hoech Dene	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans; & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	8/12
4/12	Rhine Forest (V-118)(Lib)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	5/12
26/11	Anika Oltmann	L. Triest	With T.P. Lagos/Apapa; Abidjan; Dakar; Douala; Cotonou; Nouakchott; Libreville; Matadi; Conakry; Freetown. (Carting at M-171/173 C.D.).	1/12

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
26/11	Anika Oltmann	Samrat/Hindustan/L. Triest	U.K., Cont. & Med.
28/11	Lapis	J.M. Baxi	Cont.
24/11	Mizoram	S.C.I.	U.S., Canada
24/11	Ocean Strength (V-28)	O.S.A./M.S.P.L.	Far East
26/11	Seacrest Achiever (V-224)	Seaspeed/Merzario/Penguin	U.K., Cont. & U.S.A.
26/11	Vishva Shobha	S.C.I.	U.K. Cont.

'EXXON' OFFERS BEST 'CIF' PRICES

METHYL / ETHYL MALTOL (Japan)
 DL-MALIC ACID "
 HYDRAZINE HYDRATE "
 PROPYLENE GLYCOL (USP/TECH.) "
 DI-PROPYLENE GLYCOL "

Contact:

EXXON PETROPRODUCTS & CHEMICALS PVT. LTD.

Tel: 335041/42/43

208, Samuel Street, Bombay - 400 003.
 Tlx: 011-84498 TCIB IN KIRAN 1034

Fax: 287 1441 KIRAN 1034

Materials Imported/Exported

Import values are c.i.f. port; Export values are f.o.b. port

**DYE MATERIALS
EXPORTED BOMBAY
(From 10/3/90 To 14/3/90)
(Continued from previous issue)**

SYNTHETIC COAL TAR DYES: To Barcelona: Chemex Works, 5,000 Kgs., Rs. 4,08,936; IDI Ltd., 1,000 Kgs., Rs. 2,67,000; To Busan: Pace Intl. 1,900 Kgs., Rs. 3,90,298; To Felixstowe: Colour Synth Inds. P. Ltd., 1,000 Kgs., Rs. 1,07,531; To Genoa: IDI Ltd., 1,250 Kgs., Rs. 3,58,000; To Hong Kong: Bhoir Import Export P. Ltd., 3,700 Kgs., Rs. 5,68,170; To Jakarta: Indian Dyestuffs & Chemicals, 1,000 Kgs., Rs. 1,34,468; To Keelung: United Chemie, 3,000 Kgs., Rs. 3,15,000; To Melbourne: K. Patel Chemo Pharma P. Ltd., 400 Kgs., Rs. 55,000; To Rotterdam: IDI Ltd., 1,000 Kgs., Rs. 2,38,000; To Sydney: K. Patel Chemo Pharma P. Ltd., 250 Kgs., Rs. 35,000.

SYNTHETIC ORGANIC DYES: To Antwerp: Arti Organics P. Ltd., 2,000 Kgs., Rs. 3,00,000; Indokem Ltd., 2,000 Kgs., Rs. 2,22,996; Metro Chem Inds., 2,000 Kgs., Rs. 2,25,583; To Bangkok: Monarch Dyes Inds., 4,000 Kgs., Rs. 2,48,511; To Busan: Aarti Organics P. Ltd., 1,000 Kgs., Rs. 1,96,000; Brinda Export Agencies, 200 Kgs., Rs. 61,500; Indokem Ltd., 2,500 Kgs., Rs. 2,39,745; Jaysynth Dyechem Ltd., 1,000 Kgs., Rs. 2,26,383; Mahalaxmi Chemicals Works, 700 Kgs., Rs. 2,15,081; To Charleston: Nitro Chem Corp., 500 Kgs., Rs. 70,000; To Dubai: Palmon Exports, 71 Kgs., Rs. 5,069; To Genoa: Atul Products Ltd., 14,000 Kgs., Rs. 13,45,430; To Hamburg: Kantilal Sanghvi & Co., 2,500 Kgs., Rs. 2,48,000; R.P. Trading Co., 7,000 Kgs., Rs. 14,21,276; Valia Chemicals P. Ltd., 4,000 Kgs., Rs. 6,14,500; To Hong Kong: Archana Finance Corp., 2,000 Kgs., Rs. 1,75,000; Jay Chemical Inds., 3,000 Kgs., Rs. 3,15,000. To Jakarta: Little & Co., 3,570 Kgs., Rs. 3,04,662; Monarch

Dyestuff Inds., 2,000 Kgs., Rs. 2,05,106; To Keelung: Jay Chemicals Inds., 5,000 Kgs., Rs. 85,600; To Kobe: Chromatic Dyestuffs P. Ltd., 1,000 Kgs., Rs. 1,02,128; To Melbourne: Jaysynth Dyechem Ltd., 1,600 Kgs., Rs. 1,97,447; To Mersin: Chemiequip Ltd., 5,000 Kgs., Rs. 5,25,175; To Mombasa: Jaysynth Dyechem P. Ltd., 1,850 Kgs., Rs. 3,98,468; To Montreal: Jaysynth Dyechem Ltd., 1,000 Kgs., Rs. 2,05,957; To New York: Colour Synth Inds. P. Ltd., 4,000 Kgs., Rs. 6,10,616; Jaysynth Dyechem Ltd., 10,500 Kgs., Rs. 30,21,276; To Rotterdam: Monarch Dyestuffs Inds., 2,000 Kgs., Rs. 3,28,657; To Savannah: Jaysynth Dyechem Ltd., 2,000 Kgs., Rs. 3,98,298; To Singapore: Chika Ltd., 1,000 Kgs., Rs. 98,298; Imkemex India Ltd., 1,000 Kgs., Rs. 78,230; Jay Chemical Inds., 6,750 Kgs., Rs. 8,92,000; Jaysynth Dyechem 3,050 Kgs., Rs. 3,60,851; Little & Co., 1,200 Kgs., Rs. 1,64,989.

VAT ORANGE: To Rotterdam: French Dyes & Chemicals India, 1,500 Kgs., Rs. 1,40,000.

**MATERIALS IMPORTED
BOMBAY
(From 27/6/90 To 7/7/90)**

ACRYLAMIDE: From Japan: Highland Dye Works, 1,000 Kgs., Rs. 26,177.

ACRYLIC ACID: From Japan: Aquapharm Chemicals Co. P. Ltd., 16,000 Kgs., Rs. 4,36,660.

ADIPIC ACID: From USA: Indl. Foam P. Ltd., 10,886 Kgs., Rs. 2,37,775; Kaso Chemie India Ltd., 2.5 Mts., Rs. 54,536.

ALPHA ACETO BUTYRO LACTONE: From Japan: IDPL., 15,000 Kgs., Rs. 22,32,114.

ALUMINA CALCINED: From FRG: Greaves Foseco Ltd., 500 Kgs., Rs. 9,129.

ALUMINIUM OXIDE SYN.: From USA: Grindwell Norton Ltd., 1,650 lbs., Rs. 26,128.

DL-2 AMINO-1-BUTANOL: From FRG: Lupin Labs Ltd., 30,420 Kgs., Rs. 46,29,664.

2-AMINO-6-PICOLINE: From Switzerland: Ranbaxy Labs Ltd., 2,000 Kgs., Rs. 3,71,715.

2-AMINOPYRIDINE: From USA: Kantilal Manilal & Co., 270 Kgs., Rs. 84,814.

AMMONIA ANHYDROUS: From Bahrain: E.I.D. Parry India Ltd., 1,200 Mts., Rs. 28,92,122; RCF Ltd., 3,720 Mts., Rs. 84,06,120.

AROMATIC CHEMICALS: From UK: Quest Intl. India Ltd., 380 Kgs., Rs. 1,00,665.

ARSENIC TRIOXIDE MIN 9%: From Finland: Paisa Fund Glass Works, 14.42 Mts., Rs. 87,355.

BISPHENOL-A: From Japan: A L A Chemicals Limited, 1,500 Kgs., Rs. 43,192.

CALCIUM CARBONATE: From France: Kamal Udyog, 21 Mts., Rs. 90,928.

CALCIUM SILICIDE: From France: Greaves Foseco Ltd., 5,000 Kgs., Rs. 1,71,954.

D-CAMPHOR SULPHONIC ACID: From France: Wockhardt Ltd., 2,000 Kgs., Rs. 4,18,834.

CAPROLACTAM: From Netherlands: Century Enka Ltd., 198 Mts., Rs. 60,44,354; From Netherlands: Shree Synthetics Ltd., 126 Mts., Rs. 38,48,034.

CARBOFURAN: From USA: Rallis India Ltd., 9,000 Kgs., Rs. 16,80,570.

CARBON BLACK: From FRG: Goodlass Nerolac Paints Ltd., 3,600 Kgs., Rs. 5,87,557.

1,7 CARBO METHOXY AMINO NAPHTHOL: From FRG: IDI Ltd., 1,998 Kgs., Rs. 16,55,281.

4-CHLORO 2, 5 DIMETHOXY ANILINE: From FRG: Colour Chem Ltd., 2,611 Kgs., Rs. 8,22,853.

ALPHA CHLORO HYDRINE: From Japan: Chemspec Chemicals P. Ltd., 1,250 Kgs., Rs. 55,988.

CHLORPHENIRAMINE BASE MIN 98%: From Japan: G. Amphray Labs., 1,600 Kgs., Rs. 10,12,908.

PARACHLORO TOLUENE: From Japan: 15,000 Kgs., Rs. 4,17,695.

CITRIC ACID BP 80: From China: Shah Chhaganlal Laxmichand, 16.675 Mts., Rs. 2,13,887.

2, CYANO 4 NITROANILINE: From Japan: IDI Ltd., 1,000 Kgs., Rs. 1,83,240.

CYANOPYRAZINE: From Japan: Pharmchem, 1,000 Kgs., Rs. 5,50,300.

2, CYANOPYRAZINE 99%: From Japan: Suchem Labs., 1,000 Kgs., Rs. 5,45,825.

4, CYANOPYRIDINE: From Japan:

Chandak Labs P. Ltd., 4,600 Kgs., Rs. 4,17,438; From USA: Kwizol Chem P. Ltd., 5,000 Kgs., Rs. 400,510.

4, 4 DIAMINO DIPHENYL METHANE: Dr. Beck & Co. India Ltd., 14,000 Kgs., Rs. 7,45,175.

2, 4, 2, DICHLORO AMINO DIPHENYL ETHER: From France: Shidimo Interaux P. Ltd., 60 Kgs., Rs. 1,42,088.

2, 6 DIETHYL ANILINE: From USA: Hindustan Insecticides Ltd., 27.76 Mts., Rs. 13,20,129.

DIETHYLADIAMINE: From Sweden: Mehta Pharmls Inds., 14.82 Mts., Rs. 5,39,056.

DIMETHYL SULPHOXIDE: From Japan: Burroughs Wellcome (India) Ltd., 10,120 Kgs., Rs. 2,95,819; Marvel Drugs P. Ltd., 2,640 Kgs., Rs. 82,929.

DIOCTYL PHTHALATE: From Korea: Vaji Polymers P. Ltd., 115 Mts., Rs. 15,10,977.

DIPHENYL OXIDE: From China:

Metal & Alloys Inds., 16,000 Kgs., Rs. 3,38,836.

DITERTIARY BUTYL PHENOL: From USA: IDI Ltd., 5,840 lbs., Rs. 1,22,209.

EPICHLOROHYDRIN: From USA: Dr. Beck & Co., India Ltd., 16,347 Kgs., Rs. 3,77,999; From Japan: C.H. Bhansali & Co., 4,080 Kgs., Rs. 99,682.

ETHYL DIGLYCOL (Tech): From FRG: Jaysynth Dyechem Ltd., 2,884 Kgs., Rs. 80,656.

ETHYL GLYCOL: From USA: Sun Export Corp., 15,200 Kgs., Rs. 2,67,912.

ETHYL MERCAPTAN: From Netherlands: Cynamid India Ltd., 38 Mts., Rs. 10,80,886.

ETHYLENE VINYL ACETATE: From USA: Coates Of India Ltd., 4,000 Kgs., Rs. 1,74,514.

FERRIC OXIDE: From Japan: Cosmo Ferrites Ltd., 36 Mts., Rs. 3,80,092.

ALPHA HEXYL CINNAMIC ALDEHYDE: From USA: Hindustan Lever Ltd., 1,156 Kgs., Rs. 76,114.

PARA HYDROXY PHENYL GLYCINE METHYL POT DANE SALT: From Singapore: Gujarat Lyka Organics Ltd., 4,000 Kgs., Rs. 15,35,723.

HYDROXY QUINALIDINE 4 CARBOXYLIC ACID: From FRG: Atul Products Ltd., 699 Kgs., Rs. 2,09,204.

IODINE CRUDE 99.3%: From China: Parag Pharm (India) P. Ltd., 6,000 Kgs., Rs. 16,65,119.

IODINE CRUDE: From Japan: Gayatri Labs P. Ltd., 1,000 Kgs., Rs. 2,96,674.

ISO OCTYL THIO GYLCOLATE: From FRG: Shital Chemicals P. Ltd., 3.57 Mts., Rs. 1,68,762.

ISOPHORONE: From FRG: Greaves Foseco Limited, 380 Kgs., Rs. 12,659; From Japan: Coates of India Ltd., 15,200 Kgs., Rs. 3,23,619.

Actual Consumers / Export Houses / Reputed Traders For your Requirement :

**SODIUM CHLORITE
80% / 50% Powder
MAULIBLEACH - H**

(For extraordinary bleaching)

M/S MAULIKEM PRODUCTS

**C-1, 5515, GIDC Estate, Phase III, Vatva,
AHMEDABAD 382 445**

**Phones : (F) 831037 833201
(R) 467806, 390062**

LITHOPONE: From Netherlands: U.K. Paints Inds., 60 Mts., Rs. 4,77,034.

L-LYSINE MONO HCL USP: From Japan: The Anglo French Drugs Co. Ltd., 1,000 Kgs., Rs. 97,379.

L-LYSINE HCL FIELD GRADE: From Japan: Fed N. Care, 2,500 Kgs., RSW. 1,39,611.

DL MALIC ACID: From Japan: Pioma Inds., 35 Mts., Rs. 8,41,667.

MANNITOL: From FRG: Gujarat Inject Ltd., 2,000 Mts., Rs. 91,252.

DL METHIONINE: From France: Avipharma Inds., P. Ltd., 5,000 Kgs., Rs. 1,84,985.

METHYL ACETOACETATE: From USA: Primedics P. Ltd., 15,336 Kgs., Rs. 3,88,070.

METHYL BETA NAPHTHYL KETONE: From Netherlands: Quest Intl India Ltd., 25 Kgs., Rs. 13,374.

MEG: From Saudi Arabia: ICI India Ltd., 711.564 Mts., Rs. 48,40,702; Reliance Inds., Ltd., 1016.519 Mts., Rs. 68,53,558.

OCTOIC ACID: From FRG: Meropen Labs P. Ltd., 3,145 Kgs., Rs. 71,937.

PARAFORMALDEHYDE: From Singapore: D. Jamnadas & Co., 18 Mts., Rs. 1,50,152.

D (-) ALPHA PHENYLGlycine CHLORIDE HCL: From Spain: Alembic Chemical Works Co. Ltd., 980 Kgs., Rs. 4,12,543.

PIPERAZINE ANHYDROUS: From Sweder: Cipla Ltd., 1,250 Kgs., Rs. 81,065.

PIVALOYL CHLORIDE: From FRG: Gujarat Lyka Organics Ltd., 5,040 Kgs., Rs. 4,23,439.

N PROPANOL: From FRG: Shree Venkatesh Chemi-Colour Co., 4,950 Kgs., Rs. 1,18,257; From USA: Alembic Chemical Works Co. Ltd., 13,200 Kgs., Rs. 2,32,662.

PROPARGYL ALCOHOL: From

Switzerland: Transpek Inds. Ltd., 2045.78 Kgs., Rs. 2,70,368.

PROPYLENE OXIDE: From FRG: BASF India Ltd., 12,480 Kgs., Rs. 6,20,280.

SILICON METAL: From China: Hindustan Alloys Mfg. Co. Ltd., 63 Mts., Rs. 13,74,298.

SODIUM CHLORATE: From France: Hindustan Lever Ltd., 35,000 Kgs., Rs. 3,35,939.

SODIUM NITRITE: From China: Bharat Lab. Supplies, 20,000 Kgs., Rs. 1,04,709.

SODIUM NITRITE 99%: From China: Neelraj Chemicals, 100 Mts., Rs. 4,88,639.

SULPHONIC ACID: From Taiwan: Jagsonpal Pharmls. Ltd., 600 Kgs., Rs. 1,46,591.

TARTARIC ACID BP/USP: From Italy: Lupin Labs Ltd., 18,000 Kgs., Rs. 9,74,563.

PARA TERTIARY BUTYL PHENOL: From Japan: Electronics Ensulations, 5,000 Kgs., Rs. 1,17,797.

TERBUTYL HYDROQUIONE: From UK: Marico Inds., Ltd., 150 Kgs., Rs. 59,495.

TITANIUM DIOXIDE: From China: Bhavna Textiles, 17,500 Kgs., Rs. 3,81,749; From France: Tripathi & Co., 7,620 Kgs., Rs. 3,40,302; From FRG: Nirlon Ltd., 20 Mts., Rs. 9,77,279.

TITANIUM TETRACHLORIDE: From UK: PIL, 5.088 Mts., Rs. 1,37,718.

TITANIUM DIOXIDE: From USA: Advance Paints P. Ltd., 15,000 Kgs., Rs. 6,41,339; From USA: North Star Paints & Chemicals, 8,134 Kgs., Rs. 3,76,167.

TRIETHYLENE GLYCOL: From Japan: Hico Products Ltd., 12,150 Kgs., Rs. 2,68,012.

TRIETHYLENE TETRAMINE:

From Japan: Cibatul Ltd., 16,000 Kgs., Rs. 600,328.

TRIMETHOXY BENZALDEHYDE: From China: Prasad Drugs P. Ltd., 4,900 Kgs., Rs. 18,81,261.

TRIMETHOXY BENZALDEHYDE 99%: From China: Shaba Chemicals P. Ltd., 1,000 Kgs., Rs. 3,50,736.

TRIMETHYL PHOSPHATE: From USA: Pesticides India Ltd., 15,513 Kgs., Rs. 6,37,556.

TRIPHENYL PHOSPHINE: From Japan: Ranbaxy Labs Ltd., 2,000 Kgs., Rs. 3,76,950.

VANILLIN BP/USP: From USA: Jagatjit Inds. Ltd., 3,000 Kgs., Rs. 7,46,048.

2, 4 XYLIDINE: From Switzerland: IDI Ltd., 2 Mts., Rs. 1,80,727.

PLASTICS MATERIALS IMPORTED BOMBAY (From 27/6/90 To 7/7/90)

HDPE: From Belgium: Hindustan Vacuum Glases Ltd., 17.15 Mts., Rs. 2,54,398; From Czechoslovakia: Kalpesh Plastics Inds., 62.5 Mts., Rs. 7,32,250; Progressive Trading Co., 25 Mts., Rs. 2,92,000; United Brothers, 37.5 Mts., Rs. 4,39,350; From Korea: Brij Fabrics P. Ltd., 32 Mts., Rs. 5,11,725; Garware Supermarket P. Ltd., 40 Mts., Rs. 5,95,638; Pandya Plastics P. Ltd., 32 Mts., Rs. 5,11,122; From Netherlands: Pan Asia Intl. P. Ltd., 17.5 Mts., Rs. 2,47,374; From Saudi Arabia: AL Plastics, 188.65 Mts., Rs. 26,66,687; Amar Plastics, 231 Mts., Rs. 39,65,046; Asian Paints India Ltd., 51.45 Mts., Rs. 7,58,704; Comfort Rubber Inds., 34.3 Mts., Rs. 5,38,623; Marico Inds., Ltd., 16,500 Kgs., Rs. 2,44,756; Nehal Imports P. Ltd., 16,500 Kgs., Rs. 2,33,238; Plastika Inds., 51.45 Mts., Rs. 8,03,598; Poly-films Inds., 17.15 Mts., Rs. 2,69,362; PIL, 257.7 Mts., Rs. 45,97,177; The Supreme Inds. Ltd., 148.5 Mts., Rs. 16,42,722; Vijay Kumar Ajay

Kumar, 17.15 Mts., Rs. 2,67,866; VIP Inds., 198 Mts., Rs. 27,29,748; From USA: Hosak Inds., & Plastics P. Ltd., 102 Mts., Rs. 15,19,226; Milan Inds., 15 Mts., Rs. 2,12,034; Vijay Chem & Plastics P. Ltd., 17 Mts., Rs. 2,84,807; Vipul Plastics, 14.975 Mts., Rs. 2,11,681.

LDPE: From France: Albert David Ltd., 32 Mts., Rs. 5,86,367; From FRG: Duropack Ltd., 16 Mts., Rs. 2,49,904; From Qatar: Multifilm Plastics P. Ltd., 33 Mts., Rs. 4,66,476; From Yugoslavia: Shivalik Agro Poly Prod. Ltd., 290 Mts., Rs. 43,66,623; From Canada: The Bharat Vijay Mills Ltd., 52.5 Mts., Rs. 8,74,970.

LLDPE: From Canada: Indian Packaging P. Ltd., 34 Mts., Rs. 4,40,423; From Saudi Arabia: Columbia Leasing & Finance Ltd., 65 Mts., Rs. 7,48,670.

POLYBUTENE: From Japan: Savita Chemicals Ltd., 73.44 Mts., Rs. 9,16,366; From Austria: Vijay Plastics Inds., 15 Mts., Rs. 1,89,536; From

FRG: Cosmo Films Ltd., 80 Mts., Rs. 12,42,540; From Japan: M.P. United Polypropylene Ltd., 105 Mts., Rs. 3,11,577.

POLYPROPYLENE: From Spain: Paharpur Plastics, 225 Mts., Rs. 31,49,290; From UAE: Asia Pack Ltd., 16.65 Mts., Rs. 2,39,847; From USA: Asia Pack Ltd., 83.25 Mts., Rs. 11,92,238; Bajaj Plastics Ltd., 235.5 Mts., Rs. 33,51,580; Chloride Inds., Ltd., 120 Mts., Rs. 22,51,919; From USA: Chloride Inds. Ltd., 120 Mts., Rs. 22,51,919; Columbia Leasing & Finance Ltd., 48.987 Mts., Rs. 6,35,664; Elite Inds., 80 Mts., Rs. 10,95,950; Garware Wall Ropes Ltd., 2,49,750 Kgs., Rs. 30,50,942; Superpack, 99.65 Mts., Rs. 14,40,219; The Supreme Inds. Ltd., 16.65 Mts., Rs. 2,24,784; From Yugoslavia: Alembic Chem., 77.5 Mts., Rs. 12,50,918; Jaising Packaging, 46.5 Mts., Rs. 7,33,834; Ruparel Plastics, 31 Mts., Rs. 4,88,490.

POLYSTYRENE: From Korea:

Evershine Engg. Works, 17 Mts., Rs. 3,22,566; Kuppi Utpadan, 7811.98 Kgs., Rs. 1,17,666; Xpro India, 90 Mts., Rs. 18,84,750; From Netherland: Beardsell Ltd., 10 Mts., Rs. 2,56,536.

PVC RESIN: From Brazil: Auto-plast, 25 Mts., Rs. 2,75,914; Bhagirath Agroplast P. Ltd., 64 Mts., Rs. 7,68,474; Premier Vinyl Flooring Ltd., 160 Mts., Rs. 19,39,202; From Korea: J.K. Leatherite P. Ltd., 200 Mts., Rs. 24,85,858; Morewater Pipes Ltd., 300 Mts., Rs. 37,36,116; Purti Pipes & Processors P. Ltd., 200 Mts., Rs. 23,45,880; From Mexico: Galaxy Leathers P. Ltd., 24.7 Mts., Rs. 4,43,643; Libra Plast Ltd., 24.7 Mts., Rs. 4,46,259; Northern I. Leathers Cloth Mfg. Co. Ltd., 49.4 Mts., Rs. 8,87,094; Roto Screentech P. Ltd., 49.4 Mts., Rs. 8,92,174; Unimin India Ltd., 49.95 Mts., Rs. 6,03,697.

DRUGS MATERIALS IMPORTED BOMBAY (From 27/6/90 To 7/7/90)

FURAZOLIDONE BP 80: From China: Candid Pharma, 5,000 Kgs., Rs. 6,32,614; Malav Agency, 1,000 Kgs., Rs. 1,22,160.

FURFURYL ALCOHOL: From Belgium: Glaxo India Limited, 5,040 Kgs., Rs. 1,58,319.

MORPHOLINE: From USA: Arun & Co., 3.97 Mts., Rs. 1,34,233; From USA: Burroughs Wellcome India Limited, 5,000 Kgs., Rs. 1,88,475.

PENCILLING POTASSIUM: From Netherlands: Ranbaxy Labs., Limited, 6,400 Units, Rs. 15,41,308.

SULPHADIAZINE BP 80: From China: Brooks Corporation, 1,000 Kgs., Rs. 2,13,780; J.M. Mehta, 1,500 Kgs., Rs. 2,95,802; Kylsan's Limited, 500 Kgs., Rs. 1,04,708.

THEOPHYLLINE ANHY. BP: From China: K. Sevanthilal & Co., 3,000 Kgs., Rs. 4,76,423.

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ACETYL CHLORIDE: From FRG: Cheminor Drugs Ltd., 72,200 Kgs., Rs. 17,63,933.

N-ACETYL SULPHANILYL CHLORIDE: From Japan: Standard Organics Ltd., 80 Mts., Rs. 34,11,367.

ALDEHYDE C 11: From Sweden: The Mysore Agarbathi Mfg. Co., 330 Kgs., Rs. 2,42,200.

ALUMINA: From UK: Carborandum Universal Ltd., 16,330 Kgs., Rs. 2,07,297.

ALUMINA CALCINED: From Japan: W.S. Inds. India Ltd., 105 Mts., Rs. 11,43,807.

ALUMINA OXIDE: From Japan: Elcer Substrates Ltd., 10 Mts., Rs. 1,96,190; From USA: Grindwell Norton Ltd., 7,260 lbs., Rs. 1,99,203.

ALUMINIUM OXIDE SYN.: From USA: Carborundum Universal Ltd., 40 Mts., Rs. 13,09,505.

ANTIMONY OXIDE: From UK: SRF Ltd., 1 Mts., Rs. 71,047.

AROMATIC CHEMICALS: From France: The Mysore Agarbathi Co-op. Soc. Ltd., 1,250 Kgs., Rs. 2,50,499; From UK: Bush Boake Allen Inds., Ltd., 150 Kgs., Rs. 14,930; From USA: Metro Agarbathi Co., 12,000 Kgs., Rs. 7,74,043.

AZO RIBITYLAMINE: From FRG: Babor Chemicals P. Ltd., 1,600 Kgs., Rs. 6,30,255.

TETRA BUTYL AMMONIUM BROMIDE: From USA: Cheminor Drugs Ltd., 10 Mts., Rs. 14,12,733.

TERT BUTYL PHENOL: From Japan: SIP Resins Ltd., 3,000 Kgs., Rs. 70,679.

CAPROLACTAM: From Netherlands: SRF India 714 Mts., Rs. 2,21,10,098.

CARBON BLACK: From Japan: Nova Magnetic Ltd., 767.04 Kgs., Rs. 49,967; From Korea: Fenner India Ltd., 21.110 Mts., Rs. 2,17,553.

CHLORO PYRIDINE: From Japan: Venkatrama Chemicals, 6.24 Mts., Rs. 13,41,400.

CYANOPYRIDINE: From Japan: Veer Chemie & Aromatic P. Ltd., 10 Mts., Rs. 9,59,828.

DIMETHYL TEREPHTHALATE: From FRG: I.O.C. Ltd., 1,07,920 Kgs., Rs. 20,62,674.

DIMETHYLAMINE ETHANOL: From FRG: Venkatrama Chemicals Ltd., 7,200 Kgs., Rs. 3,29,382.

DIPHENYL METHANE DIISOCYANATE: From FRG: Urethanes India Ltd., 31,500 Kgs., Rs. 13,94,012.

DIPROPYLENE GLYCOL: From France: Brakes India Limited, 17.2 Mts., Rs. 3,34,955.

EPICHLORO HYDRIN: From

Japan: E.I.D. Parry (India) Ltd., 10,000 Kgs., Rs. 2,63,066; SIP Resins Ltd., 15,040 Kgs., Rs. 3,68,777.

ETHANE: From Japan: Electronic Research Ltd., 1,620 Kgs., Rs. 36,123.

ETHYL CELLULOSE: From USA: The Mysore Lamp Works Ltd., 340.2 Kgs., Rs. 72,603.

ETHYLENE GLYCOL: From FRG: Keltron Component Complex Ltd., 16.5 Mts., Rs. 4,61,290.

EUGENOL PURE: From Singapore: Maschmeijer Aromatics P. Ltd., 50 Kgs., Rs. 7,524.

GAMMA FERRIC OXIDE: From Japan: Nova Magnetics Ltd., 2,000 Kgs., Rs. 1,84,280.

FLUOBORIC ACID: From France: ITI Ltd., 3,110 Units Rs. 2,40,065.

FURFURYL ALCOHOL: From Belgium: Globe Organics Ltd., 18,720 Kgs., Rs. 5,65,030.

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PARA HYDROXY ACETOPHENONE: From FRG: Newland Labs Ltd., 3 Mts., Rs. 8,85,392.

PARA HYDROXY PHENYL GLYCINE: From Singapore: TTK Pharma Ltd., 2,000 Kgs., Rs. 7,78,966.

HYDROXYLAMINE SULPHATE: From Japan: Standard Organics Ltd., 40 Mts., Rs. 9,49,010.

IODINE CRUDE: From Japan: Eskayef Ltd., 3,000 Kgs., Rs. 8,63,044.

ISO BORNYL ACETATE: From GDR: Krystal Chemicals P. Ltd., 45 Mts., Rs. 10,10,000.

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ISO BUTYL BENZENE: From UK: Vorin Labs P. Ltd., 13,680 Kgs., Rs. 7,99,219.

ISO EUGENOL: From Singapore: N. Ranga Rao & Sons, 200 Kgs., Rs. 32,205.

ISOEUGENOL PURE: From Singapore: Vasu Agencies, 70 Kgs., Rs. 11,110; From Switzerland: Agaroma, 200 Kgs., Rs. 37,616.

ISOPHTHALIC ACID: From Belgium: Naphtha Resins & Chemicals P. Ltd., 20 Mts., Rs. 3,18,660.

ISOPROPYLALCOHOL: From China: Shasun Drugs, 12 Mts., Rs. 1,59,306.

LINALOL: From UK: Sri Vijaya Lakshmi Agarbathi Works, 400 Kgs., Rs. 45,160.

METHYL ACETO ACETATE:

From USA: Savera Labs Ltd., 30,672 Kgs., Rs. 7,33,064.

METHYL ETHYL KETONE: From Japan: Solchem, 12.94 Mts., Rs. 1,00,459.

METHYL ISOTHOICYANATE: From France: Globe Organics Ltd., 16 Mts., Rs. 21,07,303.

METHYLENE CHLORIDE: From France: TTK Pharma Ltd., 17,000 Kgs., Rs. 1,69,443.

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NEO PENTYL GLYCOL: From Japan: Vorin Labs Ltd., 15 Mts., Rs. 3,42,373.

ALPHA PHENYL ETHYLAMINE: From Japan: Cheminor Drugs Ltd., 2,520 Kgs., Rs. 15,14,466.

PIPERAZINE ANHYDROUS: From Japan: Dr. Reddy's Labs Ltd., 20 Mts., Rs. 16,80,948.

PROPIONIC ANHYDRIDE: From Japan: Pradeep Drug Co., 1,000 Kgs., Rs. 49,672.

PYRIDINE: From Belgium: IEL Ltd., 15,200 Kgs., Rs. 8,96,094.

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